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THE POTOMAC RIVER—1985

OVERSIGHT HEARING

BEFORE THE

SUBCOMMITTEE ON GOVERNMENT OPERATIONS AND METROPOLITAN AFFAIRS

OF THE

COMMITTEE ON THE DISTRICT OF COLUMBIA HOUSE OF REPRESENTATIVES

NINETY-NINTH CONGRESS

FIRST SESSION

ON

AN OVERVIEW OF THE PROGRESS OF RIVER CLEANUP EFFORTS AND RECREATIONAL SAFETY ISSUES

MAY 29, 1985

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OVERSIGHT HEARING ON THE CONDITION OF THE POTOMAC RIVER—1985: AN OVERVIEW OF THE PROGRESS OF RIVER CLEANUP EFFORTS AND RECREATIONAL SAFETY ISSUES

WEDNESDAY, MAY 29, 1985

House of Representatives,
Subcommittee on Government Operations
and Metropolitan Affairs,
Committee on the District of Columbia,
Washington, DC.

The subcommittee met, pursuant to call, at 1:40 p.m., in room 1310, Longworth House Office Building, Hon. Michael D. Barnes (chairman of the subcommittee) presiding.

Present: Representatives Barnes, Fauntroy, and Parris.

Also present: Edward C. Sylvester, Jr., staff director; Hugh B. Calkin, staff assistant; Donn G. Davis, senior legislative associate; Tony Barrueta and Julius Hobson, Jr., staff assistants; John Gnorski, minority staff director; and Mark J. Robertson, minority staff assistant.

Mr. Barnes. Ladies and gentlemen, we will go ahead and convene this hearing of the Subcommittee on Government Operations and Metropolitan Affairs of the District of Columbia Committee.

In the summer of 1976, the Committee on the District of Columbia held the first comprehensive oversight hearings into the state of the Potomac River. It has been now almost 10 years since those hearings.

The record of those hearings showed little or no Federal leadership or coordination; Maryland, Virginia, and the District of Columbia seemed unwilling to accept mutual responsibilities relative to Potomac River water quality or overall water supply; and individual jurisdictions on both sides of the Potomac simply multiplied the degree of disarray by their own independent actions.

If those hearings did nothing else, they accomplished a public service by publicizing the lack of progress resulting from that disarray and put responsible officials on notice that the public had a right to expect greater cooperation and leadership.

In 1978, the committee held further hearings on why water supply problems seemed to be becoming an accepted way of life for the citizens of the Washington metropolitan area. At the behest of the committee, the first Potomac River Low Flow Allocation Agreement was signed by the Army Corps of Engineers, the Washington

Suburban Sanitary Commission in Maryland, the Fairfax County Water Authority, and the District of Columbia.

In 1979, I chaired a special hearing of the committee to discuss the problem of nonpoint source pollution in the Potomac. We attempted to outline the problem, bringing together various groups dealing with the Potomac.

The intervening years have seen significant accomplishments resulting from greater Federal leadership, greater recognition of mutual problems and responsibilities, and greater cooperation at all levels of government in the Washington area relative to the Potomac River.

Very recently, the corps announced that the region had developed water management techniques to coordinate upstream Potomac River reservoirs in West Virginia with reservoirs in Maryland and Virginia so that water supply needs of the Washington metropolitan area are now adequate through the year 2030.

That is indeed good news to the citizens of our whole area.

This new emphasis on cooperation has also resulted in a cleaner Potomac River. Water quality is monitored regularly by a variety of organizations from a variety of governmental agencies as they periodically were in the past, but with one major difference. Now this data is submitted to and analyzed by a central group—the Water Resources Planning Board of the Washington Metropolitan Council of Governments.

We will be hearing more about this board as the COG testifies today on the causes of algae blooms in the Potomac.

The Environmental Protection Agency will address the issues of point and nonpoint source pollution, and the Corps of Engineers will testify about the aquatic weed, hydrilla.

So, unlike 1976, the problem of water supply and water quality are not in disarray but are much more under control. What we expect to hear today is what we have to do to keep things under control and make further improvements. This is a sign of leadership and accomplishment the region can be proud of and hopefully will continue to receive.

The leadoff topic of today's hearing, recreation safety, is a relatively new problem, that will also require leadership and cooperation.

It is appropriate that, as we make progress in cleaning up the Potomac, we also make it attractive to fishing and boating enthusiasts. Unfortunately, the Potomac is not always a friendly river, as we learned again on Monday of this week, just 2 days ago, of the tragic drowning of a 16-year-old girl from my community, my hometown of Kensington, MD. Between 1975 and 1984, 22 people have drowned in the vicinity of the Little Falls Dam alone.

Congressman Frank Wolf and I have worked closely with the Corps of Engineers, the National Park Service, local police and others on an aggressive safety program to reduce the severity of this problem and to better educate the public on the potential dangers of the Potomac.

Congressman Wolf will be presenting details on that program. The National Park Service, the Maryland Department of Natural Resources, and the Corps of Engineers will review their respective roles in Potomac River safety.

It is also worth noting that the District of Columbia Committee, particularly our delegate from the District, Congressman Fauntroy, has played an important role in river rescue. In fact, a witness who will be testifying before us this afternoon may owe his life to the fact that Congressman Fauntroy and the committee introduced the "Billy Pugh net" to the Washington area with a demonstration on the Potomac River following the Air Florida crash in 1982.

Before we can truly solve this critical problem, however, the public must learn greater respect for the Potomac River. The public must become more sensitive to the risks of a summer canoe trip or even a casual jump out to a shoreline rock; 12 people died accidentally in the river last year; 5 have already drowned this year. Only a continuing public education effort can prevent this kind of tragedy in the future, and it is my hope that this afternoon's hearing can contribute to that effort.

[The prepared statement of Mr. Barnes follows:]

OPENING STATEMENT OF
CONGRESSMAN MICHAEL D. BARNES (D-8-Md)
CHAIRMAN, DISTRICT OF COLUMBIA SUBCOMMITTEE ON GOVERNMENT OPERATIONS AND METROPOLITAN AFFAIRS
"STATE OF THE POTOMAC RIVER 1985"
MAY 29, 1985

In the summer of 1976, the Committee on the District of Columbia held the first comprehensive oversight hearings into the state of the Potomac River.

The record of those hearings showed little or no federal leadership or coordination; Maryland, Virginia, and District of Columbia seemed unwilling to accept mutual responsibilities relative to Potomac River water quality or overall water supply; and individual jurisdictions on both sides of the Potomac simply multiplied the degree of disarray by independent actions.

If those hearings did nothing else, they accomplished a public service by publicizing the lack of progress resulting from that disarray and put responsible officials on notice that the public had a right to expect greater cooperation and leadership.

In 1978, the Committee held further hearings on why water supply problems seemed to be becoming an accepted way of life for the citizens of the Washington Metropolitan Area. At the behest of the Committee, the first Potomac River Low Flow Allocation Agreement was signed by the Army Corps of Engineers, the Washington Suburban Sanitary Commission, the Fairfax County Water Authority, and the District of Columbia.

In 1979, I chaired a special hearing of the Committee in order to discuss the problem of non-point pollution in the Potomac. We there attempted to outline the problem, bringing together various groups dealing with the Potomac.

The intervening years have been significant accomplishment resulting from greater federal leadership, greater recognition of mutual problems and responsibilities, and greater cooperation at all levels of government relative to the Potomac River.

Very recently, the Corps announced that the region had developed water management techniques to coordinate upstream Potomac River reservoirs in West Virginia with reservoirs in Maryland and Virginia so that water supply needs of the Washington Metropolitan Area are now adequate through the year 2030.

That is indeed good news to the citizens of Greater Washington.

This new emphasis on cooperation has also resulted in a cleaner Potomac River. Water quality is monitored regularly by a variety of organizations from a variety of of governmental agencies as they periodically were in the past, but with one major difference. Now this data is submitted to and analyzed by a central group--the Water Resources Planning Board of the Washington Metropolitan Council of Governments.

We'll be hearing more about this board as the COG testifies today on the causes of algae blooms in the Potomac.

The Environmental Protection Agency will address the issues of point and non-point pollution, and the Corps of Engineers will testify as to whether we must learn to live with the aquatic weed, Hydrilla.

So, unlike in 1976, the problems of water supply and water quality are not in disarray but are in control. What we expect to hear today is what we have to do to keep things under control. This is a sign of leadership and accomplishment the region can be proud of and hopefully will continue to receive.

The lead-off topic of today's hearing, though, is a relatively new problem that will also require leadership and cooperation. That is recreational safety on the Potomac.

It is appropriate that, as we make progress in cleaning up the Potomac, we also make it attractive to fishing and boating enthusiasts. Unfortunately, the Potomac is not always a friendly river, as we learned again on Monday with the tragic drowning of a 16 year old girl from Kensington, Maryland. Between 1975 and 1984, 22 people have drowned in the vicinity of the Little Falls Dam alone.

Congressman Wolf and I have worked closely with the Corps of Engineers, the National Park Service, local police and others others on an aggressive safety program to reduce the severity of this problem and to better educate the public in general on the potential dangers of the Potomac.

Congressman Wolf will be presenting details on that program, and the National Park Service, the Maryland Department of Natural Resources, and the Corps of Engineers will review their respective roles in Potomac River safety.

It is also worth noting that the District of Columbia Committee, particularly Congressman Fauntroy, has played an important role in river rescue. In fact, a witness who will be testifying before us today may owe his life to the fact that Congressman Fauntroy and the Committee introduced the "Billy Pugh Net" to the Washington area with a demonstration on the Potomac River following the Air Florida crash in 1982.

Before we can truly solve this critical problem, however, the public must learn greater respect for the Potomac River. The public must become more sensitive to the risks of a summer canoe trip or even a casual jump out to a shore-line rock. Twelve people died accidentally in the river last year; already five have drowned this year. Only a continuing public education effort can prevent such deaths in the future, and it is my sincere hope that this hearing today can contribute to that effort.

Mr. BARNES. At this point I want to recognize the ranking Republican member of the subcommittee, my friend from northern Virginia, Mr. Parris, for any opening comments that you may have.

Mr. PARRIS. Thank you very much, Mr. Chairman.

I would like to commend the chairman and the subcommittee for the consideration and attention being provided to the problems associated with water quality and safety on the Potomac River. These have been matters of great interest and concern to myself, many of our other colleagues, and those whom I have the honor to represent in my district.

At this point in the hearing let me just for a moment focus on water safety. In the past several years there has been a great deal of local media coverage on subjects ranging from the infestation of the Potomac by the dreaded hydrilla to actual film footage of daring attempts by the U.S. Park Police aviation section and others to rescue persons from particularly hazardous areas of the Potomac between Chain Bridge and Great Falls. We will be sharing some of that footage with you later on the monitors that you see before you.

We have recently seen the development of a multitiered approach toward solving the safety problem on the Potomac—that problem being primarily one of ignorance on the part of some of the public. More specifically, a small minority of the river's users refuse to heed warnings of its sheer power and, therefore, do not give it the respect it commands.

This multitiered approach includes, but is not limited to, increased attention to public education on the hazards of certain segments of the river and more deterrent/preventive measures including warning signs and stepped-up law enforcement efforts and others. As has been mentioned by Mr. Barnes, I commend my distinguished colleague, Mr. Wolf, for his efforts in the latter category.

Already, in 1985, cruiser, scooter, horse-mounted, and foot patrols by U.S. Park Police have resulted in 5 swimming complaints, 4 drug-related incidents, 5 injured persons, and 33 liquor law violations—all of which were adjacent to the Potomac River and could have been involved in river accidents.

A very important part of this overall picture is rescue capability. Unfortunately, a substantial increase in the number of rescues attempted on the Potomac has been noted in the past 60 days. In 1982, U.S. Park Police helicopters rescued 12 persons from the Potomac River. In 1983, 11 persons were rescued from the river, all from the Great Falls area; 11 were also rescued in 1984, all except 1 from north of Chain Bridge. Two of those were from the Brookmont Dam incident which claimed the lives of five people.

With that historical data in mind, consider the following: In a 30-day period in April and May of this year, already 13 rescues have been effected by the Park Police aircraft division. This is particularly sobering. That might be a good word, Mr. Chairman. This is particularly sobering in view of the fact that the 1985 season is just beginning.

Mr. Chairman, I would take this opportunity to commend Mr. Fish, Regional Director of the National Park Service, for the excellent work that he and his men are doing, particularly in the areas of water safety and emergency rescue.

I would also thank Mr. Earl "Butch" Cronin, one of the Park Police helicopter pilots—I had the opportunity to fly with him the other day—for joining us today so that we may have the benefit of his expertise in these matters. Mr. Cronin is a Vietnam veteran who, during his tour, accrued over 800 hours of combat flying. He was awarded three Distinguished Flying Crosses, the Air Medal with V, the Bronze Star, the Army Commendation Medal with V, the Purple Heart, and others.

Mr. Cronin has been a pilot with the Park Police since 1975. In 1976, he was awarded the Department of Interior Valor Award. Since 1975, Mr. Cronin has also participated in numerous committees, commissions, and advisory groups in areas such as emergency medicine and airborne law enforcement.

Let me, Mr. Chairman, with that comment ask unanimous consent to submit my entire statement for the record, and we will hear from the witnesses.

Mr. **Barnes**. The gentleman's entire statement will be included in the record, and I thank him for his excellent comments.

[The prepared statement of Mr. Parris follows:]

Statement of Hon. Stanford Parris

Thank you, Mr. Chairman, I would commend the subcommittee for the consideration and attention being provided to the problems associated with water quality and safety on the Potomac River. These have been matters of great concern to myself and those who I have the honor to represent.

In the past several years, we have seen a great deal of local media coverage on subjects ranging from the infestation of the Potomac by Hydrilla, to actual film footage of daring attempts by the U.S. Park Police Aviation Section and others to rescue recreational users of the Potomac in areas from Chain Bridge to Great Falls and beyond.

We have recently seen the development of a multi-tiered approach towards solving the safety problem on the Potomac—that problem being primarily one of ignorance on the part of the public. More specifically, a small minority of the river's users refuse to believe that its power is so great and, therefore, do not give it the respect it commands.

This multi-tiered approach includes, but is not limited to, increased attention to public education on the hazards of certain segments of the river and more deterrent/preventative measures including warning signs and stepped-up law enforcement efforts. I commend my distinguished colleague, Mr. Wolf, for his efforts in the latter.

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Mr. Chairman, I would take this opportunity to commend Mr. Fish, Regional Director of the National Park Service, for the excellent work that he and his men are doing in this area.

I would also thank Mr. Earl Cronin, one of the Park Police helicopter Pilots, for joining us today so that we may have the benefit of his expertise in these matters.

Mr. Cronin is a Vietnam veteran who, during his tour, accrued over 800 hours of combat flying. He was awarded 3 Distinguished Flying Crosses, the Air Medal with "V," the Bronze Star, the Army Commendation Medal with "V," and the Purple Heart.

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Mr. **Barnes**. We now want to welcome our first witness this afternoon. We do have a long list of experts to hear from. Our first witness is one of our colleagues, the gentleman from Virginia, Mr. Wolf.

Frank, come to the witness table, if you will.

Congressman Wolf has been a leader on issues affecting the Potomac River. We are very pleased to have you here this afternoon. We welcome your testimony.

STATEMENT OF HON. FRANK R. WOLF, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF VIRGINIA

Mr. **Wolf**. Good afternoon. I am very pleased to have the opportunity to testify at this important meeting on the Potomac River. I want to thank you, Mr. Chairman, for inviting me to be here today and I also want to commend you for the work you have done and the leadership you have shown on this issue.

I will keep my remarks brief, Mr. Chairman, and because there will be others following me who will address the various issues in great detail, I will concentrate on giving an overview of the safety issues for that area of the Potomac from Great Falls downstream to Chain Bridge.

Just the other day, a 16-year-old girl from Kensington, MD, fell off some rocks and into the river at Great Falls Park in Virginia. She is still missing, likely to be the sixth victim this year of those dangerous waters. This is clearly an unacceptable situation, and I believe that all of us in this region should do all we can to find solutions that provide the best possible river safety on the Potomac.

With your indulgence, I thought this might be an opportunity to recap what has already happened in improving Potomac River safety in the past year, a year following the unfortunate incident in which five people drowned in a single boating incident when they attempted to float over Little Falls Dam.

First, with regard to Little Falls Dam itself, I am pleased that the Army Corps of Engineers has taken steps to modify the dam by beginning work this summer to place grout-filled bags just past the dam's spillover which some call the drowning machine. The modification will cost about $3.5 million and will be done with existing funds. It will not need any additional funds, but existing funds, reprogrammed, that have already been appropriated to the District of Columbia and left over from the construction of the McMillan Reservoir.

I want to thank the District and the District Appropriations Committee and the Army Corps of Engineers for moving so quickly on that.

In addition to the dam modification, the corps has placed large Coast Guard-type warning buoys above the dam, and the National

Park Service has shown excellent cooperation in the placement of warning signs at canoe entry points along the river. Again, in close cooperation with the Army Corps of Engineers, the buoys this year are larger, they are farther upstream, and the Park Service has taken the effort to put the large billboard signs along the river.

While these actions have been very positive, they have not done enough to curb the number of waders, swimmers, and rock-hoppers along the dangerous river shores. Much of the problem this year has focused not on Little Falls but on the area farther upstream, near Great Falls.

In investigating this problem together, Mr. Chairman, I think you will agree we have found that one of the most frustrating aspects is the overlapping jurisdictional question with regard to placement of warnings, educational efforts, and especially with regard to enforcement. The National Park Service is involved, the District of Columbia is involved, the State of Maryland is involved, and both Montgomery County in Maryland and Fairfax County in Virginia are involved.

The recent action initiated by the National Park Service, in cooperation with the Justice Department, calling for mandatory court appearances for those who enter the river illegally, is an example of the necessity for interjurisdictional cooperation. The National Park Service's jurisdiction only extends to the water's edge. Once a violator enters the river, he or she is no longer under the purview of the National Park Service, but instead the State of Maryland. It seems clear that the Maryland Department of Natural Resources must be given greater enforcement capability, and I hope that some sort of interjurisdictional enforcement arrangement with the National Park Police can be worked out.

I would strongly support an arrangement like this, and hope that the panel members who will follow me can address the feasibility of working out the details on such a plan. I might add that the Metropolitan Washington Council of Governments [COG] supports a cooperative arrangement, and I believe that organization can serve as an important resource on this critical regional issue.

There is so much more to discuss, Mr. Chairman, but I think I will stop at this point and allow the various panel members to discuss in greater detail the myriad of safety and water quality issues with regard to the Potomac. Before I conclude, however, I want to recognize two groups which have made special efforts to alert people in this area to the dangers on the river. The first is the Canoe Cruisers Association, which is made up of some of the most experienced users of the Potomac who have given of their time to offer ongoing boating safety lessons to those who are less experienced.

The second is the Fairfax County Professional Firefighters who recently put together an excellent pamphlet to make young people and others aware of the dangers associated with the river. More than 44,000 young people in Fairfax County have already received the pamphlet in their classrooms, and others will be available in boat rental outlets.

That concludes my statement, and I again want to publicly thank you again, Mr. Chairman, and the Army Corps of Engineers and the Park Service, for moving so quickly, and my colleague Congressman Parris for his great support in moving to try to solve this problem. Greater education I think is an answer but I think if we can get this interjurisdictional regional cooperation I think that might help us. Thank you.

Mr. BARNES. Thank you for your work, and continued work, on this. Mr. Parris.

Mr. PARRIS. We have talked briefly about this, Frank. I gather you are optimistic about the recent programming that has been announced by the U.S. attorney in Virginia in regard to the prosecution of people who walk in from accessible areas?

Mr. WOLF. Yes.

Mr. PARRIS. I gather you favor that?

Mr. WOLF. Well, I do. Up until now, a citation at the river has been treated like a parking ticket. It has been $25. You are a pilot, you would have a better idea. But somehow or other, the rescue of individuals must cost upward of several thousand dollars. Here we were pulling people out.

Some were joking about it, indicating that they could have gotten out on their own, when experienced people know that they could not have, and then they were given a $25 citation, a parking ticket. So what Elsie Munsel and the Department of Justice are doing, they are going to prosecute fully, a court appearance, and also hopefully levy very, very heavy fines, up to $200, perhaps even up to $500.

Mr. PARRIS. I would share with you the fact that the operating cost of the helicopter is $300 an hour. The mathematics can't——

Mr. WOLF. And very dangerous to the pilots as they come in there to rescue people.

Mr. PARRIS. Thank you.

Mr. BARNES. Again, Frank, we thank you very much for taking the time during the recess to come on over and present your testimony. I know Stan and I both look forward to continuing to work with you on these issues.

Mr. WOLF. Thank you.

Mr. BARNES. Thank you.

Our next witness knows from firsthand experience just how dangerous the Potomac River can be. On May 5 of last year, Specialist Joseph Douglas Odell of the U.S. Army was rescued from the Potomac River by the U.S. Park Service. Five of his companions were not rescued and died on the river.

Quite honestly, I initially hesitated to invite Specialist Odell, because of the obvious trauma associated with reliving such an experience, to testify in a public forum as this, but I decided to leave the decision up to him. His decision was to testify in the hope that his description of his experience might serve some purpose in preventing others from experiencing the same kind of tragedy that befell his group.

I would ask now Specialist Odell to come up to the table. We very much appreciate your being here this afternoon, and we welcome your comments. Thank you for being here. Please proceed.

STATEMENT OF SPECIALIST JOSEPH DOUGLAS ODELL, U.S. ARMY

Specialist ODELL. On Friday, May 4, 1984, six of us had decided to take a raft down the Potomac River. During our lunch break on this day, we rented the equipment from the Fort Myer Recreation Center. I couldn't wait until the next morning because this was going to be my first rafting trip. The other five had done some rafting in their home States.

Saturday morning came and I was really psyched for the day's events. A friend of John Bestor had come by the barracks just to say hello. John immediately asked her to join us. She said yes, and we were off.

Our first stop was underneath Chain Bridge. I don't know the name of the road we were on. We had taken three cars, mine, Brian DiGregarrio's, but I don't know who the other car belonged to. The reason this was our first stop was to drop off one of the cars. This area of the river was to be our final destination. Everybody piled into the other cars and we set out for our starting point by Angler's Inn.

We arrived about 20 minutes later, unloaded the gear and headed down to the river. We inflated the raft, loaded ourselves onto the raft. We were finally off.

The start of the trip was real smooth, no rough water. There were really no tough ripples or anything, just some mild waves. We made one stop along the way so we could stretch our legs, about one-half mile upriver from the dam. We took off again, and as we approached the dam area, maybe 150 to 200 meters from the dam, there were some people fishing off the cement wall, waving at us and telling us to turn around and go back.

The reasons we did not heed their advice is, first, I had never experienced anything like this and wanted to see and feel what it was like, and, second, the Sunday before, John Bestor and a few different guys from Charlie company had gone over the same area of the river with no problems. But we did not take into consideration that it had rained quite heavily on the third and fourth, raising the river considerably. So we drove on.

About 75 meters before the dam, everybody sat down in the bottom of the raft and braced ourselves. We made sure we had our lifejackets on and were secure. John didn't have one because he gave his to Sue Risner. We went over the dam, and the nose of the raft turned to the right, toward Virginia. We knew we were caught in something bigger than we could handle.

We tried paddling toward the Virginia side of the river, but the current was taking us to the other side. Everybody had fallen out at least once, but was able to get back in, except John. The fourth time he had fallen out of the raft was his last. We never saw John again.

During this time, we had been bouncing back and forth between the hydraulics and the dam, and we were taking on more and more water every time. Then the last time we hit the dam, it flipped over. When we came up, Ray Jerdi was on my right and Sue and John Wright could not be seen.

Before we had been flipped over, the Park Police helicopter had flown over us, then left to get the rescue net. As I said, Sue and John could not be seen. Ray and I had our backs flush to the dam. I could hear somebody screaming but couldn't see who it was or where it was coming from.

Underneath the water, I could feel somebody grabbing my legs but I could not control them due to the force of the water coming over the dam. Brad Dragel and I used the buddy system to pull ourselves up onto the raft. As we got up onto the raft, the helicopter came over us with the net.

There was no room inside of it for both of us so we grabbed the outside of the net. We started to lift off and move away from the dam. When we were away from the dam, I couldn't feel the net due to the numbness of hypothermia and fell back into the river.

When I came up, my lifejacket was still on my arm. I tried to swim toward the crowd that had gathered on shore, but the current took me downriver. I caught sight of some bushes above the waterline. I grabbed them and waited for the helicopter to come back. It came back, got me and dropped me off at Snake Island where Dragel had already been. They went to look for more survivors.

The rescuers took us one at a time to the waiting medics and ambulances. Then we were taken to Bethesda Naval Hospital.

We were told while waiting to be released, that we were the only two to come out of it alive.

Mr. BARNES. Once again, I want to thank you for your willingness to come and go through this experience for us.

Based upon what happened to you and your friends a little over 1 year ago, what advice would you have for other people that are considering going out on the river for a day of rafting, canoeing, or recreation?

Specialist ODELL. Just use all safety precautions necessary, and that are available.

Mr. BARNES. Congressman Parris, do you have any questions of Specialist Odell?

Mr. PARRIS. No thank you.

Mr. BARNES. Thank you again very much for sharing this with us. I think it is very helpful for people to know first hand the dangers of the river, and I know it has to be very difficult for you to be here today. Thank you.

Specialist ODELL. You are welcome.

Mr. BARNES. Ladies and gentlemen, we will take a 2-minute recess.

[A short recess was taken.]

Mr. BARNES. Ladies and gentlemen, we will reconvene.

Congressman Parris has arranged for us to be able to see a brief film. Are there any comments you wanted to make?

Mr. PARRIS. Just very quickly, Mike. This is a 3-minute clip of the rescue efforts in the Little Falls Dam situation that was referred to by Specialist Odell. The chairman believed, and I certainly concurred, that it would have been insensitive to have him experience this again in what was and is obviously a highly emotional experience for him, but we wanted to utilize the availability of this clip to try to dramatize for everybody present here to add to his comment in regard to that incident.

I think the important consideration is what I understand is called a hydraulic that occurs at that location.

[At this point a video tape was shown.]

Mr. **Parris**. The human being that dropped off that net in that clip was Specialist Odell, and he was the gentleman that was picked up in the second portion. You saw the little grassy area that he alluded to that he had grabbed hold of. That was him.

Mr. **Barnes**. Thank you for arranging for the film. I think it does very graphically demonstrate what we are talking about here.

Now we will hear from a panel of experts on these issues: Verna Harrison, assistant secretary of the Maryland Department of Natural Resources; Manus J. Fish, Jr., Director, National Capital Region, National Park Service; and Col. Martin Walsh, Jr., U.S. Army Corps of Engineers.

Will you all please come up to the witnesses table? I am very pleased to have all three of you here this afternoon. We welcome your testimony on this issue.

Colonel, why don't you lead off?

STATEMENTS OF COL. MARTIN WALSH, JR., U.S. ARMY CORPS OF ENGINEERS; VERNA HARRISON, ASSISTANT SECRETARY, MARYLAND DEPARTMENT OF NATURAL RESOURCES; AND MANUS J. FISH, JR., DIRECTOR, NATIONAL CAPITAL REGION, NATIONAL PARK SERVICE

STATEMENT OF COL. MARTIN WALSH, JR.

Colonel **Walsh**. Mr. Chairman and members of the committee, I am pleased to appear before your committee to discuss what the U.S. Army Corps of Engineers is doing to address the issue of water safety on the Potomac River.

With your permission, Mr. Chairman, I would like to proceed by presenting an overview of my formal statement, which has been submitted for the record.

Mr. **Barnes**. Colonel, that is excellent. We do have a lot of witnesses this afternoon, so I would encourage all the witnesses to follow your example, and summarize your formal testimony. We will put that in the record and then we can have a little more time for discussion.

Thank you.

Colonel **Walsh**. First, I will discuss Little Falls Dam, describing the current situation and the measures we are taking to enhance safety at that site. Then I will describe flood protection measures for Washington, DC.

Little Falls Dam is located in the Potomac River between Virginia and Maryland just west of Washington, DC. The Corps of Engineers completed the dam in 1958, owns it, and is responsible for its operation and maintenance. The 1,400-foot long dam is used to divert water from the Potomac to the corps' Washington aqueduct facility for treatment. The aqueduct provides clean drinking water to Washington and northern Virginia.

The design of Little Falls Dam is such that a vertical roller forms below the dam, as shown in the upper part of the diagram to my left. A vertical roller is a flow condition that occurs when water plunging over the dam is deflected at the bottom and forms a vertical circular motion. The roller keeps the water from scouring out a hole under the dam, which could cause the dam to collapse. When we built the dam, creation of a vertical roller was considered the best professional design.

Between 1975 and 1985, 17 people drowned in the vicinity of the dam. Tragically, some of the victims ignored warning signs and underestimated the treacherous conditions. They attempted either to boat over the dam or to walk across it. They were caught by the vertical roller below the dam and became trapped in its turbulent flow.

To help reduce the possibility of an accident similar to last May's tragedy, we were requested to investigate methods to enhance safety measures at Little Falls Dam. This is not to say that we waited for an accident before acting. From the time we completed the dam, we have warned people of its danger and tried to keep them away from it. Warning signs and buoys were posted upstream and the danger of the dam widely publicized. Unfortunately, with increased recreational use of the river, more people have challenged the perilous situation.

Last summer, we erected an even larger warning sign on Snake Island in the middle of the river. This past winter we developed and put into place a new buoy system to again forewarn the public of impending danger. We have coordinated our efforts with the National Park Service, which has installed large warning signs on both river banks, and with the Maryland Department of Natural Resources Police and their Virginia counterparts, who have increased their law enforcement efforts. We also took part in a series of meetings with public and private individuals and agencies concerned about safety on the river. We incorporated many of their views into our investigations.

We fully realize that people must stay away from the dam. But we also realize there are a few individuals who will not heed our boldest warnings. However, we can't remove the dam. It is vital to the water supply of Washington and northern Virginia. So we focused our efforts on making the situation as safe as possible. Having tried almost every method to warn the public, we concluded that modifications should be made to the dam itself.

We looked at many alternatives, but quickly narrowed them down to three. One was removal of a rubble dam downstream. But this is a historic structure that diverts water to the C&O Canal. It cannot be removed, nor would its removal affect the roller condition at Little Falls.

Both remaining alternatives involved extending the downstream face of the dam to eliminate the roller effect. One was to place 4- to 5-foot diameter stones over the entire surface, the other, as shown in the lower portion of the diagram, was to construct a series of concrete-filled bags to redirect the water's flow and velocity over the dam. Because the bags lack the jagged edge of rocks, they pose less danger to the public should someone still attempt to canoe over the dam. We thus plan to use concrete filled bags.

We are also studying the feasibility of including a fish passage in the modification. If we do, we may enable migrating fish to return to historical spawning upstream of the Little Falls Dam. Coupled with continued improvements in the water quality of the river and with steps by State and Federal fisheries to stock and monitor migratory species, a fish passage will contribute to the goal of improving the Potomac River and Chesapeake Bay, as we simultaneously fulfill the primary mission of public safety.

We are preparing final plans and specifications for the corrective measures and expect to have them completed by June 28. We aim to start construction of the improvements in August and to finish them in December. Our estimate of the project cost is $3.4 million.

Now, I would like to address flood protection at Washington, DC. Flooding on the Potomac River at Washington, DC, is caused by both tidal flooding from Chesapeake Bay and flood flows on the Potomac upstream from Washington. Historic flood flows combined with high tides have caused the highest observed levels on the Potomac in Washington. These occurred in June 1889, March 1936, and October 1942.

The 1936 flood took two lives and caused an estimated $5.3 million in damages at 1984 price levels. That same year Congress passed a Flood Control Act authorizing a flood protection project for Washington. The corps completed the project in 1940 at a cost of $332,000. It serves to this day as Washington's frontline protection against a flood. The existing project consists of several distinct parts.

The Potomac Park segment of the project consists of a levee paralleling the reflecting pool of the Lincoln Memorial. In a flood emergency, temporary earthen barriers are to be erected across 17th Street and across Constitution Avenue north of the Lincoln Memoral. Temporary sandbag closures are also needed at P Street adjacent to Fort McNair.

The Anacostia levee segment stretches along the left bank of the Anacostia River from the northern tip of Bolling Air Force Base, past the U.S. Naval Air Station, to a bend in the Anacostia just north of the Frederick Douglas Memorial Bridge.

In October 1942, Washington was flooded when a high tide coincided with the third highest flow of record on the Potomac River. The resulting flood stage was the highest on record and caused an estimated $9 million in damages at 1984 price levels. Extensive temporary dikes constructed under emergency conditions to close the openings in the existing project prevented serious flooding in the downtown area.

Based on experience gained during the 1942 flood, the corps recommended that permanent closures are made in the project in lieu of the temporary ones. There was concern—and there remains concern—that the emergency measures might not be effective during a large flood, especially one higher than the 1942 flood.

In the 1936 Flood Control Act, Congress authorized that permanent closures are considered, but the improvements were never constructed. Since that time, the project has remained inactive.

In 1978, the corps undertook a review of the project to determine whether or not the permanent closures should be deauthorized. We concluded that the modifications identified in 1946 were economically justified, would provide more reliable protection for the downtown area, would enhance the city's level of flood protection, and would require less commitment of personnel, equipment, and materials in the event of a flood.

Today, continued development in Metropolitan Washington could have significant impact on potential flood damage in the downtown area. Interstate highways, subway lines, and many public and private buildings constructed since the 1942 flood suggest the scale of damage that might occur.

If the emergency closures failed in a flood, particularly one greater than the 1942 event, many important buildings would be flooded. Among them would be the Departments of Commerce, Justice, Labor, and Health and Human Services; public and private museums housing the Nation's historical and cultural treasures; and various monuments and memorials. The southern portion of the Ellipse and the Vietnam Memorial would be under water.

Although other government agencies have certain responsibilities during flood emergencies, the Corps of Engineers has overall responsibility for flood emergency planning and coordination of activities to ensure effective flood protection for the city. As part of this responsibility, we periodically update the operation and maintenance manual of the project and, with the responsible agencies, make annual inspections of the levees.

In short, we are concerned that the temporary closures may prove ineffective if a flood greater than that experienced in 1942 occurs, and we are concerned about the potential level of damage, as indicated on the graphic to my left, should those closures fail.

We are now reviewing the desirability of constructing the permanent closures in the project. With the approval of the National Park Service and the D.C. government, we will reactivate the project modification. We also will seek the necessary funds to evaluate the current level of protection to verify that the project will protect the city in light of the significant changes that have taken place since the project was constructed.

Thank you.

[The prepared statement of Colonel Walsh follows:]

STATEMENT OF
COLONEL MARTIN W. WALSH, Jr.
DISTRICT ENGINEER
BALTIMORE DISTRICT, CORPS OF ENGINEERS

before the
Subcommittee on Government Operations
and Metropolitan Affairs
Committee on the District of Columbia
U.S. House of Representatives

Thank you for the opportunity to appear before the committee today to respond to your questions on hydrilla, flood protection and river safety. I will address each topic separately.

I. HYDRILLA

BACKGROUND

During the past three years, hydrilla (Hydrilla verticillata), a highly competitive non-native submerged aquatic plant, has become established in the Potomac River from Alexandria to Mount Vernon, Virginia. The plant is believed to have been inadvertently introduced as part of a program to reestablish beneficial submerged aquatic vegetation (SAV) in the tidal freshwater portion of the river which had been previously devoid of SAV for years. Since its introduction, the plant has spread rapidly to about 600 acres of the the waterway and has started to create serious problems by restricting boating and other recreational uses of shallow water areas. Based on past experience with the Florida variety (dioecious) in the southern United States, the continued spread of the Potomac River biotype (monoecious) of hydrilla could present a severe management problem in the entire upper one-third of the Potomac estuary.

In recognition of this potential threat, the State of Maryland and Commonwealth of Virginia made formal application to the Baltimore District, Corps of Engineers for a study of hydrilla in letters dated 29 June 1984 and 11 September 1984, respectively. Other formal expressions of support for a Corps study and aquatic plant control program have been provided by Congressmen, other elected local officials, the Interstate Commission on the Potomac River Basin, the Metropolitan Washington Council of Governments, and numerous community associations and special interest groups.

In response to these requests the Corps initiated action under the general continuing authority of Section 302 of the Rivers and Harbors Act of 1965 which states in part:

> "There is hereby authorized a comprehensive program to provide for control and progressive eradication of water-hyacinth, alligatorweed, Eurasian watermilfoil, and other obnoxious aquatic plant growths, from the navigable waters, tributary streams, connecting channels, and other allied waters of the United States, in the combined interest of navigation, flood control, drainage, agriculture, fish and wildlife conservation, public health, and related purposes, including continued

research for development of the most effective and economic control measures, to be administered by the Chief of Engineers, under the direction of the Secretary of the Army, in cooperation with other Federal and state agencies. Local interests shall agree to hold and save the United States free from claims that may occur from control operations and to participate to the extent of 30 per centum of the cost of such operations. Cost for research and planning undertaken pursuant to the authorities of this section shall be borne fully by the Federal Government."

HISTORY AND DESCRIPTION

Since 1983, about a dozen species of aquatic plants have become established in the tidal freshwater portion of the river above Quantico, Virginia. The reappearance of aquatic plants is widely viewed as a welcome trend and an indication that water quality conditions in the Potomac River are improving. The presence of lush beds of SAV has been irregular over the past century. During the 1920's and 1930's there was a general decline in all species of SAV in the Potomac River. Since then, with the exception of a brief period during the early 1960's when Eurasian watermilfoil became widespread, SAV has generally been scarce. The late 1960's and 1970's were a period in which virtually no submerged plants were found in the Potomac River above Quantico, Virginia.

While the overall return of SAV is an encouraging development, hydrilla which is known to be a particularly troublesome species, has also become locally abundant. The appearance and rapid spread of hydrilla in the Potomac River is of particular concern to the affected states, and the District of Columbia, and those who use the waterbody for recreation, commercial navigation, fishing and other activities. This concern stems from knowledge of the plant's demonstrated aggressiveness in other lakes and rivers throughout the United States and its potential for creating serious problems.

Hydrilla, a monocotyledon, considered to be monotypic in the family Hydrocharitaceae, is an exotic submersed aquatic plant. It was first discovered in Florida in 1960 and was apparently introduced from the Middle East with the aquarium trade. Since 1960, it has spread rapidly across North America and has reached problem levels in most water bodies where it has become established. Its broad ecological variability has enabled it to thrive in riverine and lacustrine environments in the southeastern United States, in irrigation and drainage canals in California, and in water bodies as far north as Ireland (about 35 degrees North). It can withstand wide variations in pH, alkalinity, nutrient levels, and thrives at water temperatures above 17 degrees C. Its salinity limit is about 12 to 15 parts per thousand (ppt). With this wide range of environmental tolerances, hydrilla has the potential for establishment throughout the United States. Hydrilla is able to rapidly dominate an entire body of water through its very efficient means of reproduction. The monoecious (producing male and female flowers) biotype found in the Potomac River reproduces in six ways:

(1) Winter-buds (axillary turions) which develop at nodes of upright stems.

(2) By tubers (subterranean turions) which develop within the hydrosoil. These tubers can grow to 4 or more inches below the hydrosoil surface and have been known to remain dormant up to 10 years.

(3) By runners along the bottom surface.

(4) By rhizomes, horizontal stems under the hydrosoil.

(5) By root and leaf fragments which break loose, sink to the bottom, and establish new colonies.

(6) By seed. This last method, unknown in Florida where the dioecious (female flower only) is found, is of special concern because sexual reproduction allows for evolution and adaptation to the environment.

Hydrilla is an aggresive competitor that often excludes existing populations of beneficial native aquatic macrophyte species from the aquatic ecosystem. It has no natural enemies on this continent. An important factor in its ability to dominate a habitat is its low light compensation point. This allows hydrilla to begin growth sooner in the spring and to grow deeper in the water than most native species, a distinct competitive advantage. In some rare cases hydrilla has been found growing at depths of up to 30 feet in extremely clear water. It is generally a problem only at shallower depths (15 to 20 feet or less) and in the Potomac River it has not been found in greater than seven feet of water. Given these competitive advantages, we anticipate that hydrilla will prove to be a dominant and troublesome species in the Potomac River in future years. Hydrilla characteristically forms thick, nearly impregnable mats of stems and leaves at and below the water surface and consequently collects and holds floating debris, impacts commercial navigation and water based recreational activity, shades out and outcompetes more benefical SAV, increases mosquito and pest habitat, and deprives game fish by protecting their prey. Many of these adverse impacts were noted in localized areas along the Potomac shoreline during 1984 and similar problems are anticipated in many additional areas during the upcoming growing season.

Conversely hydrilla can provide some beneficial values similar to native SAV in the Chesapeake Bay. Native SAV's in the Chesapeake Bay Area are functionally important in the aquatic ecosystem because they superimpose a structural component on an otherwise bare sand or mud bottom. This structure serves as a habitat for many vertebrate and invertebrate species such that the density and diversity of animal life is significantly higher than adjacent, unvegetated areas. In addition, SAV areas serve as refuge for some early life stages of fish and invertebrates. The spawning activities of some organisms require SAV's. Furthermore, they help stabilize sediments and reduce shoreline erosion, serve as nutrient traps for dissolved phosphorus and nitrogen, improve water quality by removing noxious substances from the water, and provide an important source of detritus. The ability to assimilate inorganic substances into organic compounds usable by other organisms enhances the importance of these plants as a vital link in the food chain. Though not commonly viewed as indicators of biological conditions or trends, SAV's are considered to be potentially useful as an indicator of pollution trends. While hydrilla in small amounts may contribute to the overall improvement of the environment in the Potomac estuary, it's "attributes" must be weighed against the eventuality of an over abundance of the species and the overriding negative impacts associated with it. While it is not now possible nor desirable to eradicate hydrilla because of its widespread presence in the river, the plant can be managed to minimize the conflicts it creates with waterborne related activities.

CURRENT AND ANTICIPATED PROBLEM AREAS

Within the Virginia portion of the region, hydrilla has been found in both impounded waters and the Potomac River and tributaries. At least 50 percent of a 215-acre recreational lake in Fairfax County was infested with hydrilla in 1984. Hydrilla has also been found along the Virginia side of the Potomac River between Alexandria and Dogue Creek as shown on Figure 1. The primary area of infestation is the Dyke Marsh area along the George Washington Memorial Parkway. Dyke Marsh is located in Virginia waters and is under the jurisdiction of the National Park Service. The total acreage impacted by hydrilla in the Virginia portion of the study area was estimated at 100 acres in 1984.

Similar to Virginia, hydrilla has been found in both impounded and free flowing waters of the State of Maryland. Within Maryland, the plant has been found in both Lake Needwood and Pine Lake. Both of these lakes are located in Montgomery County and are used for recreational purposes. Lake Needwood is a 74-acre lake that was approximately 50 percent infested; however, the Maryland National Capital Parks and Planning Commission (MNCPPC) treated the lake with herbicides in June 1984 and achieved effective control during the season. MNCPPC also successfully treated several other smaller impoundments with endothall last year. As shown in Figure 1 hydrilla has also been found in the Potomac River and tributaries between the Woodrow Wilson Bridge south to Chicamuxen Creek. Established colonies were noted in Broad Creek, Swan Creek and Piscataway Creek. At present Hydrilla is not found in pure stands, but occurs with other SAV's such as watermilfoil, coontail, wild celery, and redhead grass. In 1984 hydrilla was also found in scattered patches along the Maryland shoreline downstream to Mallows Bay. The total acreage infested in the Potomac River and tributaries in Maryland waters is estimated to be approximately 500 acres.

Within Washington, D.C., hydrilla has been found in a number of the architectural and environmental gardens administered by the National Park Service. These include Constitution Gardens, the Reflecting Pool and Kenilworth Gardens. Because of concerns relative to degradation of aesthetic values and the spread of the plant to other areas the Park Service has used mechanical and chemical measures to control the plant in the above areas. As shown on Figure 1 the plant has also been found in limited areas along the Alexandria waterfront between National Airport and the Woodrow Wilson Bridge.

By the end of the 1984 boating season, hydrilla had substantially impacted recreational boating activities at two marina facilities along the Virginia shore and numerous private property owners between Alexandria and Mount Vernon along both sides of the river. Boaters reported navigational difficulties particularly during the fall die-back of hydrilla when large mats of decaying hydrilla floated downstream. Approximately 75 marina activities between Washington, D.C. and the Route 301 Bridge which includes commercial and charter boat fishing activites could become impacted by hydrilla should the species continue to proliferate at its present rate. Given the suitable water quality conditions which now exist in the Potomac and hydrilla's known rate of reproduction it is possible that more than 34,000 acres of waterway within this reach could become invaded by the plant over the next ten years (Figure 2).

Water quality is a key factor in determining future SAV conditions in the river. Water quality has improved substantially over the past five years due to point source pollution controls. Reductions in the region's sewage treatment plant phosphorus discharges has contributed significantly to recent improvements in water quality which have no doubt had a good deal to do with the resurgence of SAV in the upper Potomac. While it is extremely difficult to predict water quality conditions very far into the future because of the river's dynamic character, generally improved water quality conditions should sustain the spread of SAV, including hydrilla. The upper freshwater tidal portion of the river, most notably, will show the greatest improvement due to its proximity to the regional sewage treatment system. Areas which will likely be impacted by hydrilla are the shallow flats that are less than six feet in depth and are adjacent to the main channel and tributaries. This area accounts for over 50 percent of the available water surface between the District of Columbia and Quantico, Virginia.

MANAGEMENT AND CONTROL OF HYDRILLA

Management and control of hydrilla can be accomplished using several available methods in use around the U.S. today. These methods can be grouped into chemical, mechanical/-physical, and biological control techniques.

Herbicides

Based on the experience of the Corps of Engineers' Jacksonville District in the Aquatic Plant Control Program in the State of Florida, the most cost-effective control measure is treatment with chemical herbicides that are injurious to the plants but relatively safe for fish, wildlife, and other mammals, including man. Of the 53,800 acres of aquatic plants controlled in Florida in 1984, under this program alone, approximately 13 percent or 7,200 acres involved hydrilla. The majority of aquatic plant control was for water hyacinth which is common to warm southerly climates. About ninety-nine percent of the total acreage controlled for all plants was accomplished using herbicides and about ninety-four percent of the hydrilla infested areas was also controlled using this method. Control of the small remaining acreages was accomplished largely by mechanical harvesting. Harvesting is conducted where unsatisfactory flow conditions reduces the contact time and hence effectiveness of the preferred herbicides. The program is conducted in close coordination with the Florida Fish and Game Commission and numerous state and county level agencies and is done in numerous environmentally sensitive and rich areas with no ill effects. Approximately 60 percent of the cost-shared $2.5 million program in Florida was attributable to hydrilla control in 1984 as it is more costly to treat hydrilla than it is for floating water hyacinth which can be more cheaply controlled by aerial spraying. Herbicides are the control method of choice for aquatic plants in general where such use has EPA approval and in Florida as well as many other states with aquatic plant control problems to include North Carolina, Alabama and several others.

Only herbicides that are registered for aquatic use under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) can be considered. These herbicides are copper complexes, diquat, endothall, and fluridone. Only diquat and copper complexes have a current EPA - approved label for use in flowing water and therefore only these could be used in the Potomac River at this time.

Diquat destroys plant growth by interrupting the photosynthesis process. It does not kill the entire plant as the roots remain viable and will produce new growth. There remains a number of questions regarding the effectiveness of this herbicide in the Potomac River and those questions should be resolved prior to any decision regarding the initiation of a large scale treatment program. These questions relate to the composition of the suspended particulate in the treatment areas during the hydrilla growing season, flow velocities within the treated areas, and the rate of hydrilla uptake of the diquat under these conditions. To answer these questions a small scale demonstration field test to assess the effectiveness of diquat in controlling hydrilla was proposed by the Corps for the Potomac River in Fall 1984 and Spring 1985. In separate letters, the Secretary of Natural Resources in Maryland and the Secretary of Commerce and Resources in Virginia objected to testing the herbicide. Therefore, the Corps has decided not to test the effectiveness of diquat at this time. Based on the present available data diquat's effectiveness in the Potomac River is questionable. Further evaluation of this option will be made on the basis of cost and effectiveness studies based on actual experience at other locations and on laboratory research done by the U.S. Army Corps of Engineers Waterways Experiment Station. If herbicides turn out to be safe and the most cost effective control measures for certain areas and the states remain opposed to their use, we will use methods acceptable to the states, but they will have to pay 100 percent of any costs in excess of those estimated for herbicides.

Copper complexes have been used for many years for algae control and more recently to manage hydrilla. Copper concentrations in sediments and in biological components of aquatic systems can measurably increase following repeated use, possibly resulting in adverse effects. Therefore, the use of copper complexes is not recommended as a method for controlling hydrilla in the Potomac River.

While other herbicides including endothall and fluridone have been successfully used in closed water systems such as reservoirs and ponds, additional testing will be required by EPA prior to any decision to allow full registration for their use in flowing water. Indications are that full endothall labelling is three to four years off whereas fluridone may be available for use within a year. Regardless of the herbicide available, demonstration field testing is recommended to ensure their effectiveness in the Potomac River environment due to the hydrodynamic conditions. The Corps will continue to work with the states, toward the development of a safe, controlled, herbicide testing program that would provide a better understanding of the effectiveness and environmental impacts of herbicide use.

Mechanical/Physical Controls

A mechanical/physical control technique is one that directly or indirectly interferes with the growth or spread of an aquatic plant through mechanical or physical manipulation of the plant or its habitat. Under this broad definition, a wide variety of techniques could be included such as: cutting and harvesting of aquatic plants; placement of bottom-covering material over aquatic plant-infested sediments; dredging aquatic plant-infested bottom sediments; mechanical agitation of bottom sediments to detach root material; confinement or collection of detached plant material; temporary reduction of water level to expose and kill root material within the sediments; and addition of light-shading material (dye) to the water. All of these techniques have been used with varying degrees of success around the world. Perhaps the most promising and practical methods available for use in the Potomac River include mechanical harvesting, bottom barriers, and dredging on a small scale. To date, the resource agencies and the affected states in the Potomac area have indicated a preference for mechanical/physical control measures.

Mechanical/physical controls are used in other Corps' programs but generally at a much smaller scale than herbicides. These controls are generally employed for two reasons: 1) due to unsatisfactory control from herbicides because of unfavorable flow and turbidity levels and 2) policy considerations founded on environmental concerns which preclude the use of herbicides. The Municipality of Metropolitan Seattle (METRO) for example has conducted an aquatic plant harvesting program for watermilfoil for five years as part of the Corps' program. Over a five year period, approximately 600 acres were controlled in lakes around the metropolitan Seattle area using two mechanical harvesters. METRO policy advises against the use of herbicides, however, if all other methods are not considered feasible, then endothall is the only chemical suggested for use. The New Orleans District of the Corps terminated use of mechanical harvesters in 1972 due to unsatisfactory control levels and now relies exclusively on herbicides in its program.

Biological Controls

Biological control refers to the use of living organisms to suppress the population of an undesirable plant species. It includes the augmentation of endemic enemies and the release of exotic natural enemies. Ideally, a bio-control agent is host specific, attacking only the target plant, and maintaining it below the problem level. The major categories of biological control include fish, insects, and micro-organisms. With the exception of hydrilla consuming grass carp which have used successfully to control SAV in closed lakes and ponds in this country for the last 20 years, the remaining methods are still in the research phase and have been untested in large scale field areas against hydrilla. Presently, the most successful biological control for hydrilla is grass carp, an exotic fish species, however, the fish is non-selective in its food preference, is wide ranging, and can tolerate relatively high salinities. Grass carp are best employed as hydrilla control agents in ponds, lakes, and other freshwater sites where they can be contained. At the present time, both the State of Maryland and the U.S. Fish and Wildlife Service are opposed to the introduction of grass carp in the Potomac River because of the potential impact on native SAV in the river and the Chesapeake Bay.

Grass carp were introduced in two of the region's lakes in 1984 for hyrilla control. In September, 1984 the Virginia Commission of Game and Inland Fisheries stocked 2,200 sterile grass carp in Burke Lake, a 218-acre hydrilla infested waterbody in Fairfax County. Results should be available after this growing season as to the effectiveness of this action. In Reston, Virginia, the local homeowner's association introduced about 325 grass carp at a rate of about 8 carp per acre in a small lake in July 1984. As in the case of Burke Lake, no results are available yet, however, the 1985 growing season should yield some pertinent information.

The effectiveness of grass carp is variable depending upon the stocking rates, water temperatures, water quality and level of plant infestation. At Lake Conway Florida, the Corps has been heavily involved in a large scale test to control hydrilla and other macrophytes. More than 8,000 grass carp were stocked at a rate of 3-5 per acre. In 18 months, hydrilla was reduced by about 90 percent.

STATUS OF CORPS EFFORTS

The development of an environmentally safe, acceptable, and cost-efficient program to manage and control hydrilla in the Potomac River is the primary goal of the Baltimore District's activities. The Corps' program consists of two ongoing elements to include identification of the action plan to meet the above goal, and the research and development to support the planning effort and actual control operations. Assuming the planning study identifies an environmentally acceptable and economical plan that non-Federal interests are willing to cost-share, a full scale operational program for the Potomac River could be initiated in 1986. Other areas within the Chesapeake Bay which may become affected in the future can be included in the Corps program based on a supplementary planning evaluation of those areas on an as needed basis. Costs for the planning and research and development program are fully Federally funded whereas costs for the operational program requires cost-sharing with a non-Federal entity. Cost-sharing for aquatic plant control under Department of the Army proposed legislation (H.R. 1557 and S.534) will require 50 percent non-Federal participation in the operational program.

Planning Studies

In response to the initial inquiries by the states and others for Corps assistance, the Baltimore District completed a reconnaissance level study in September, 1984. The study determined that during 1984, hydrilla existed in sufficient quantities along the Potomac River to constitute a known problem of economic importance, although the plant problems were still in their early stages and affected only a few areas. They were expected to spread to a much larger area in future years. The report determined that there was a Federal interest in aquatic plant control in the Potomac River based on a preliminary analysis of existing and projected hydrilla related problems and potential solutions. On that basis, the study concluded that further Federal involvement was warranted in conducting more detailed studies in the form of a State Design Memorandum (SDM) which would recommend a control program.

The SDM is now under preparation by the Baltimore District. The document, which will be accompanied by an Environmental Impact Statement (EIS), will evaluate the full range of control measures currently available including chemical, physical/mechanical, and biological means. The SDM represents the document upon which final decisions will be made on the part of potential non-Federal sponsers for entering into a joint Federal - non-Federal hydrilla control program. A draft cooperative agreement stipulating the willingness and responsibilities of the affected parties in participating in hydrilla control will be part of the SDM and, it is assumed, that the prospective non-Federal sponsers will indicate their intent to enter such an agreement based on the SDM findings. A draft SDM will be available for public review in November of this year. The final SDM is scheduled for completion in March 1986.

Based on progress to date, the report will likely contain recommendations for future control of hydrilla in high public use areas such as marinas and navigation access lanes. Therefore, control should be confined to relatively small areas leaving the larger contiguous areas of hydrilla which represent little conflict with water related uses largely unaffected by control operations. Given this management objective, which is wholly consistent with the goals of the respective states, the environmental impacts of the controls are expected to be minimal.

RESEARCH AND DEVELOPMENT

The Corps has initiated a comprehensive research and development program to support the formulation of an acceptable control plan and to increase our level of understanding regarding monoecious hydrilla in the Potomac River. These efforts should enhance future management decisions regarding hydrilla control in the region and will also have a bearing on aquatic plant control throughout the Chesapeake Bay. The program is being headed by the Aquatic Plant Research Program at the Corps of Engineers Waterways Experiment Station (WES) in Vicksburg, Mississippi under the general direction of the Baltimore District. WES has engaged the services of many nationally known experts from various Federal agencies, academic institutions, and private contractors to assist in this effort. The research and development program consists of the following major elements: a field demonstration testing program, related analytical laboratory studies, and aquatic plant surveys.

Field Demonstration Testing

A series of field demonstration tests were initiated during the Fall, 1984 in hydrilla infested areas along the Potomac River. The primary objectives of the tests, were to provide site-specific information regarding the costs, effectiveness, and impacts of some of the more promising control techniques available today.

1984 Field Testing

During October, 1984 a mechanical harvesting test was conducted at Belle Haven Marina, Virginia; Old Town Yacht Basin, Alexandria; and Broad Creek, Maryland. The mechanical harvester is a floating cutter/collection system that detaches plant material in its path up to a depth of 5 feet and temporarily holds the harvested plant material which is subsequently off-loaded for upland disposal. The tests demonstrated that harvesting in the Potomac River at selected marinas and in the open river is feasible. On the average, the mechanical harvester was able to clear 1/4-acre per hour depending upon the density of hydrilla biomass in the target area. It is estimated from these tests that a harvesting would cost approximately $600 per acre. Although plant fragmentation occurs due to harvesting operations, it is not felt that these operations would significantly contribute to the spread of hydrilla when conducted in relatively small control areas and using safe standard operational practices. No further testing of the mechanical harvesting is planned at this time.

In addition to mechanical harvesting, the Corp's placed barrier mats on the channel bottom at Swan Creek along the Maryland shore in 1984. Barrier mats include a broad range of materials that can control the growth of rooted aquatic plants by altering of the plant's environment through reduction of light, compressing and confining the plant tissue leading to a reducing chemical environment, and providing a physical barrier through which plants cannot penetrate. Barrier mats are most appropriate in small areas in an around boat slips due to their high cost ($3,000 - $4,000 per acre) and propensity to be impacted by environmental factors which reduce their effectiveness. In 1985, the matted areas will be monitored to determine their stability during the winter months, to measure associated sedimentation on top of them, and to measure the encroachment of the surrounding hydrilla canopy from adjacent unmatted areas.

As noted earlier, the Corps' proposal to conduct a limited field test in Virginia waters using the chemical herbicide diquat in 1984 was terminated due to objections by the State of Maryland and the Commonwealth of Virginia and owing to the fact that the testing was delayed late into the growing season, thus jeopardizing the Corps' objective of securing reliable test data. As will be noted later, further Corps' efforts to undertake similar testing in 1985 were also terminated.

1985 Field Testing

Field demonstration tests this year are planned to complement earlier efforts accomplished in 1984. The tests will involve further investigation of barrier mat materials, use of a diver assisted dredge, and the transplanting of native submersed aquatic vegetation to halt the spread of hydrilla.

Approximately one-half acre of dartek and a newly manufactured material called texel will be placed in two of the access lanes and numerous slips within the Old Town Yacht Basin in Alexandria, Virginia. during the week of 20 May 1984. This test will yield information regarding actual installation/maintenance procedures and the rate of installation/areal coverage relationships which are possible in a marina situation. Continued monitoring of this area as well as in the areas matted in 1984 will be accomplished during the entire 1985 growing season.

A diver operated dredge test is planned for June, 1985 at the Belle Haven Marina on the Virginia shore. The test will involve a prototype device consisting of a small scale suction dredge manually operated by a pair of divers. This method, which has been used in New York, Wisconsin, California, and in Canada is most appropriate in confined and obstacle-filled areas such as marinas and is being tested to secure engineering performance data in a typical Potomac River setting.

The Corps will also transplant native submersed aquatic vegetation to determine if they can successfully compete with hydrilla and prevent its spread. These tests will be conducted in six 6 meter by 3 meter plots at four separate locations along the Virginia and Maryland shoreline. Transplanting will be initiated in late May/early June followed by intensive monitoring of the success of the transplanting and the rate of hydrilla invasion in the plots over the entire growing season. The test is being coordinated with the U.S. Fish and Wildlife Service, U.S. Geological Survey, Virginia Institute of Marine Science, University of Maryland and states and Maryland and Virginia.

The Corps' proposal for conducting a carefully controlled small scale field demonstration test involving the chemical herbicide diquat during the 1985 growing season was developed by Corps' planners to address the issues regarding the effectiveness of diquat in controlling hydrilla and, most importantly, the herbicides fate and environmental persistence in the Potomac River. The field tests were to have involved the closely monitored and controlled application of diquat in three two-area plots in Virginia waters of the Potomac River. The tests were to be preceded by dye tests to determine flow patterns and other hydrodynamic conditions which could influence the dispersion of diquat during and subsequent to its application. Based on experience in many of the Corps' southern districts who have had a long history of aquatic weed problems, it was felt that herbicides were probably the most effective and least costly control option available. However, field experience also indicated that diquat is less effective in turbid waters than in clear waters and that the testing would provide information on the effectiveness of diquat. The testing was coordinated with Federal and state agencies, and Congressional and environmental interests. The concurrence of both Maryland and Virginia were requested and a series of staff level meetings were held to discuss the testing in detail. Each state declared their opposition to the testing, however, further indicated their continued support of our work in evaluating all control measures in the future. Based on the views of the states and others, the diquat testing will not be conducted at this time.

Laboratory Research

The major portion of the research and development program will be conducted in highly controlled experimental conditions utilizing both indoor and outdoor laboratory facilities. This type of research is essential so that the individual and interactive factors which affect the growth, reproduction, and spread of the monoecious form can be better understood. Most of the data available today are based on the southern dioecious variety and it is widely recognized among aquatic plant experts that these data cannot be readily extended to monoecious hydrilla. Therefore, the laboratory research set forth in the Corps' program will close the information gaps which now exist and in the long run improve the overall prediction capability regarding the spread and the control of monoecious hydrilla in the Potomac River and the Chesapeake Bay.

The laboratory studies are centered on investigations related to the following areas of concern: reproduction, growth characteristics, environmental tolerances, competition with other species, and use of hydrilla by waterfowl, fish and invertebrate species.

The reproduction studies will focus on the viability of hydrilla's numerous reproductive features including turions, tubers, and stem fragments. Related growth studies regarding such environmental factors as the effect of nutrients in the water column and sediment, variation in available light, and salinity are also key. Competition work in outdoor tanks at the University of Maryland's Center for Environmental and Estuarine Studies, Horn Point Environmental Laboratories will provide information regarding the long term distributional potential of hydrilla and to what extent it can outcompete selected native aquatic species which typify the river and Bay. Finally, the U.S. Fish and Wildlife is conducting limited laboratory and field studies to establish the true ecological value of hydrilla for wildlife present in the system.

In support of the District's hydrilla control program, WES is also involved in further laboratory research regarding the effectiveness of herbicides. This research will provide some herbicide related information in the absence of site-specific field data, although this testing would not be as site specific as actual field testing. Research includes the evaluation of conventional herbicide formulations in flowing water conditions simulated by laboratory flumes, a determination of the herbicide uptake characteristics of hydrilla, and minimum exposure time necessary to control the plant.

Surveys

The last element of the research and development program pertains to distributional surveys of the plant in the river. The purpose of this program is to obtain accurate field information on the distribution, density, and spread of hydrilla. These surveys will span the 1984-1986 growing season and provide successive years of data which can be correlated with the laboratory work to allow a complete assessment of the controlling factors which affect hydrilla growth. The work is being conducted largely by the U.S. Geological Survey which has studied SAV patterns in the Potomac River for years and the Northern Virginia Community College. The field data will be correlated with aerial photo information and entered into an integrated data base with mapping capability.

OPERATIONAL PROGRAM

Given an acceptable plan for management and control of hydrilla is reached between the Corps, the states, and the District of Columbia, actual management and control operations could begin during 1986. We believe that the most prudent approach to dealing with this inter-jurisdictional problem is a regional one involving all of the affected parties including the Corps, State of Maryland, Commonwealth of Virginia and District of Columbia. To accomplish this, we have formed a Potomac River Hydrilla Management Committee in conjunction with the Metropolitan Washington Council of Governments. This committee, which consists of representatives from the states, local jurisdictions and the National Park Service will be asked to participate in a joint Federal/non-Federal program and secure the necessary non-Federal funding to help finance control and management operations. The Federal/non-Federal partnership must be secured if future control of hydrilla is to be realized under the Corps' Aquatic Plant Program.

II. WASHINGTON, D.C. FLOOD PROTECTION

HISTORIC PROBLEMS

Flooding on the Potomac River at Washington, D.C. is affected by both the tidal flooding from the Chesapeake Bay and the flood flows on the Potomac River upstream from Washington, D.C.

Historic flood flows combined with high tide elevations which have caused the highest observed elevations on the Potomac River in Washington, D.C., occurred in June 1889, March 1936 and October 1942. The resulting water surface elevations on the Potomac River in Washington, D.C. from the combined effects of fluvial and tidal influence were about the same magnitude in June 1889 and March 1936. The combined fluvial and tidal influence of the October 1942 flood led to water surface elevations about 1/2 foot higher than in 1936 on the Potomac River.

The flooding in March 1936 led to the loss of two lives and an estimated $5,300,000 (1984 dollars) in damages in Washington, D.C. The observed Potomac River water surface elevation near Wisconsin Avenue was about 17.11 feet above low water datum (LWD) and downstream at Fort McNair, the elevation was about 11.31 feet LWD. The October 1942 flood with a crest stage about 1/2 foot higher than the 1936 flood led to damages of about $8,900,000 (1984 dollars) in Washington, D.C. The area flooded by the 1942 flood is shown on Figure 3. A large portion of the increase in damages over the 1936 flood resulted from the concentration of temporary buildings and other activities along the waterfront. However, the damages would have been much higher without the timely organization of emergency protection facilities which protected the downtown area from flooding (see Figure 3 - 1942 potential flood area).

Maximum water surface elevation of 15.41 feet above LWD on the Potomac river at Wisconsin Avenue was observed for the flood of June 1972. However, it should be noted that the Theodore Roosevelt Bridge built in the 1960's markedly affects the water surface elevations upstream from the bridge. The June 1972 flood elevation at Wisconsin Avenue would be about 1 foot lower without the Theodore Roosevelt Bridge in place.

Flood damage at the Anacostia levee portion of the project has in recent years been due to interior drainage problems. However, during the Agnes storm of 1972, the Anacostia levee prevented the flooding of the Naval Air Station by the backwater of the Potomac River. Other flood events, for which limited data are available occured in 1877, 1881, 1924 and 1937.

The area flooded by the October 1942 flood included East and West Potomac Park, areas on Maine Avenue, Ft. McNair, the Navy Yard, Anacostia Park, area North of Naval Air Station, Bolling Field, and approaches to Washington National Airport.

PROJECT AUTHORITY

The 1936 Flood Control Act, authorized the flood protection project for Washington, D.C. The Act states in part:

> "Washington, District of Columbia: Levees and grade raising to protect downtown portion of Washington, Arlington Experimental Farm, Bolling Field, and Anacostia Naval Air Station; plans in House Document Numbered 101, Seventy-third Congress, first session; estimated construction cost, $571,000; estimated cost of lands and damages, $16,000."

The plan consisted of:

(a) Levee from Lincoln Memorial to Washington Monument.
(b) Raising P Street SW.
(c) Floodgates on sewer outlets.
(d) Levee around Arlington farm and airport.
(e) Levee around Bolling Field and adjustments at naval air station.

LOCATION AND DESCRIPTION OF THE EXISTING IMPROVEMENTS

The existing project shown in Figure 4 provides flood protection to downtown Washington, D.C. and to the area in and around the Anacostia Naval Air Station. The Potomac Park levee protects Washington, D.C., from the flood waters of the Potomac River while the Anacostia levee protects the Anacostia Naval Air Station from flood waters of the Anacostia River and backwater effects of the Potomac River. The drainage area of the Anacostia River and the Potomac River above their confluence at the project sites are approximately 170 and 11,700 square miles, respectively.

The Washington, D.C. and Vicinity flood protection project is in two segments. One segment of the improvement is located at Constitution Gardens and is known as the Potomac Park levee, the other segment stretches along the left bank of the Anacostia River from a point 500 feet inside the bounds of Bolling Air Force Base along the riverfront of the Anacostia Naval Air Station (NAS) to a point where the U.S. Botanic Gardens extension abut the U.S. Naval Station Anacostia Annex (Anacostia NAS Annex) and is known as the Anacostia levee. The construction of the project was completed in 1940 at a cost of $332,000.

The Potomac Park segment of the project, as constructed, consisted of a levee supported by a retaining wall that paralleled the reflecting pool of the Lincoln Memorial. Positive closures were installed on large pipe lines that pass through the line of protection. A grade raising was authorized at P and Canal Streets as part of the project. Temporary earth and sandbag closures were indicated across 17th Street and across Constitution Avenue. The Potomac Park levee was designed with top of protection of 20.5 feet LWD. The Anacostia segment of the project, as constructed, consisted of a levee on the left Anacostia Riverbank the first 500 feet of which was on Bolling Field. The levee from the Bolling Field property proceeded 3,150 feet upstream along the shore front of the NAS to the edge of the NAS seaplane ramp. As the project was constructed, the ramp was closed with a wooden dam approximately 430 feet in length. An 850-foot long seawall, with two wooden closures, extended from the upstream edge of the seaplane ramp. A levee was keyed to the northeast end of the seawall and extended 4,420 feet upstream to a point beyond the bounds of the NAS. At this point the levee was interruped by high ground created when ramps were built for the South Capital Street bridge. Approximately 900 feet upstream from where the levee tied into the bridge ramps, the levee started again and continued for about 1,000 feet and then turned landward on National Park Service (NPS) and Architect of the Capitol (AOC) lands to high ground. The design height of the Anacostia levee was 16.26 feet LWD. Sluice gates and flap gates were placed on the riverward end of pipes through the line of protection and four pumping stations were included to pump interior drainage to the river in times of high water.

The project was designed to provide protection against a flood discharge of 700,000 cubic feet per second (cfs) on the Potomac River coincident with a high tide at the confluence with the Anacostia River. It was assumed that flows on the Anacostia River would have a negligible effect on the flood stage. At the time of project design, the flow corresponded to the flood having a .60 percent chance of being equaled or exceeded in any given year (i.e. 164-year flood).

There are two major damage centers for which the protective works were built. The two areas are downtown Washington, D.C. (protected by the Potomac Park levee) and the Anacostia Naval Air Station, a portion of the Bolling Field and the Botanic Garden Extension (protected by the Anacostia levee). The Potomac Park levee protects residences, commercial and Government facilities, while the Anacostia River levee protects barracks, aircraft hangers, shops, etc. plus military tenant facilities.

1946 PROJECT MODIFICATION

An excerpt from the 1946 Flood Control Act is quoted as follows:

> "The project for protection at Washington, District of Columbia, on Potomac River, authorized by the Act of June 22, 1936, is hereby modified substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 622, Seventy-ninth Congress, second session, at an estimated cost of $500,000."

From House Document No. 622, cited above the following was the Chief of Engineers recommendation:

> "(2) modification of the existing flood-control project for Washington, D.C., to eliminate the protective works for Arlington Experimental Farm and to provide for protection of the downtown area substantially as recommended by the District Engineer but modified (a) as may be found desirable by the Chief of Engineers to conform to future landscaping of the Mall after the removal of temporary buildings and (b) to provide a removable closure at Seventeenth Street in lieu of raising the

> grade of the street, the structure to be designed in consultation with the Director, National Park Service, and approved by the Commission of Fine Arts, at an estimated cost to the United States of $500,000 for construction and $5,000 annually for maintenance and operation;"

However, this work has not been accomplished.

1978 REEVALUATION

Under the authority of Section 12 of the Water Resources Development Act of 1974, a deauthorization review was made of the authorized but unconstructed improvements in July 1978. The review recommended that the unconstructed portions of the project remain authorized since they were economically justified, would provide a more reliable means of protecting the downtown area, would restore the design level of protection, and would require less commitment of personnel, equipment, and materials in the event of a flood.

TODAYS CONDITIONS

Based on preliminary data, the area that would be affected by an occurrence of the design flood, if the project did not function properly, is shown on Figure 4 (1985 - without closures, potential flood area). Important buildings in this area include:

- Department of Commerce
- Post Office Department
- Internal Revenue Service
- Department of Justice/FBI Building
- National Archives
- Federal Trade Commission
- Department of Labor
- National Museum of History and Technology
- National Museum of Natural History
- National Gallery of Art
- District Building
- U.S. Court House
- Rayburn House Office Building
- Space Computing Center
- Employment Security Building
- Public Library Administration Office
- Department of Health, Education, and Welfare
- Food and Drug Administration
- Social Security Administration

Changing conditions such as new highway systems, the Metro construction, and private development, as well as changes in the Potomac River itself, including the Bloomington Dam completed in 1981, could have an impact on flood damage potential in the District of Columbia.

CURRENT PROJECT STATUS

Two temporary earth levees have been incorporated into the Potomac Park Flood Protection Works. The purpose of the levees is to close low areas of 17th Street and Constitution Avenue to maintain design protection (El. 20.5' L.W.D.) in conjunction with the existing permanent levee. Construction of these levees is to be performed in accordance with existing plans in the Flood Emergency Manual, Washington Metropolitan Area. In summary, the levees are raised in successive steps corresponding to the predicted river stage at the Wisconsin Avenue gage. These levees which would be constructed in the event of a flood threat and removed when the threat is over, will provide protection against the design discharge of 700,000 cubic feet per second.

Responsibility for construction of these levees lies with the National Park Service (NPS), National Capital Region. Due to esthetic considerations, the NPS does not stockpile areas of filldirt. Trucking of fill material is necessary. Officials of NPS have stated that if absolutely necessary borrow material could be excavated from nearby parkland. At their maximum, the levee at 17th Street would be 10 feet high and 441 feet long requiring 2,285 cubic yards of fill material. At Constitution Avenue the levee would be 1.5 feet high and 393 feet long, and require 175 cubic yards of fill material.

P Street and Canal Street Closures

A sandbag closure 1.5 feet high and 125 feet long using 1,380 sandbags is required across a driveway through the circumferential wall of Ft. McNair with a second closure across 2nd Street from the Ft. McNair wall to the wall of an apartment house. This function is the responsibility of the District of Columbia Government along with closing a large gate on an outfall conduit at the end of P Street.

In addition to the above mentioned agencies, certain responsibilities during flood emergencies rest with the Architect of the Capital, G.S.A., the Military District of Washington, the Navy and Air Force.

The Corps of Engineers has overall responsibility for flood emergency planning and coordination of activities to ensure the effective functioning of the project. An Operation and Maintenance manual is periodically updated and annual inspections of the project are made with the responsible agencies.

We have initiated a review of the project to determine the desirability of constructing the permanent closures to the project. We are concerned about the effectiveness of the temporary emergency measures for floods greater than the 1942 flood and the resulting damages to government facilities, priceless historical artifacts and art and the interruption of key government functions should those measures fail.

III. RIVER SAFETY AT LITTLE FALLS DAM

INTRODUCTION

The Little Falls Dam is located in the Potomac River between Virginia and Maryland and just west of Washington, DC. The 1400-foot-long dam is used to divert water from the Potomac River into the Little Falls pumping station which pumps waters to the Washington Aqueduct for treatment and distribution in the Washington, DC area. The old historic rubble dam located approximately 30 feet downstream of the Little Falls Dam is used to divert water into the Chesapeake and Ohio Canal. The dam is a historic landmark and cannot be removed.

CURRENT CONDITION

The design of the Little Falls Dam is such that a vertical roller forms below the dam. The vertical roller is a flow condition that occurs when the plunging jet of water which flows over the dam is deflected causing a turbulent reverse circulation. This aids in dissipating energy, thereby reducing velocities before entering the exit channel. The roller helps keep the water from scouring the riverbed and possibly causing damage under the dam. Between 1975 and 1985 a total of 17 people drowned in vicinity of the dam. The victims ignored warning signs and attempted to boat over the dam. Boats were caught in the vertical roller below the dam and submerged by the turbulent flow. In order to help eliminate the possibility of an accident similar to that which occurred on 5 May 1984, the Corps was requested to investigate methods to improve safety conditions at Little Falls Dam. Since the dam was built people have been made aware of the dangerous conditions. Warning signs and buoys were posted upstream and the dangerous conditions have been publicized.

CORRECTIVE ACTIONS

In order to warn of impending danger at the dam a warning sign was constructed on Snake Island in August 1984 and a larger buoy system was placed approximately 2,000 feet upstream of the dam on 28 February 1985. The Corps of Engineers has coordinated with the State of Maryland, Department of Natural Resources, who have increased their law enforcement efforts on the Potomac River. A series of meetings were held with public and private individuals and agencies concerned with safety on the Potomac River. Many of the views of those people were incorporated in our investigation.

Every effort possible has been made to educate and warn boaters of the danger at the dam. Since there are still people who do not heed the warnings, the Baltimore District was requested to investigate existing flow conditions at the dam and determine what would be required to eliminate the vertical roller just downstream of the dam. A 1:30-scale model which reproduced 240 feet of approach channel, a 30-foot section of the Little Falls Dam, and 240 feet of exit channel which included the old rubble dam was used to determine the following:

a. Flow conditions with existing prototype conditions.

b. Flow conditions with the end sill removed on the Little Falls Dam.

c. Flow conditions with the old rubble dam removed.

d. Modifications to the Little Falls Dam that would eliminate the vertical roller.

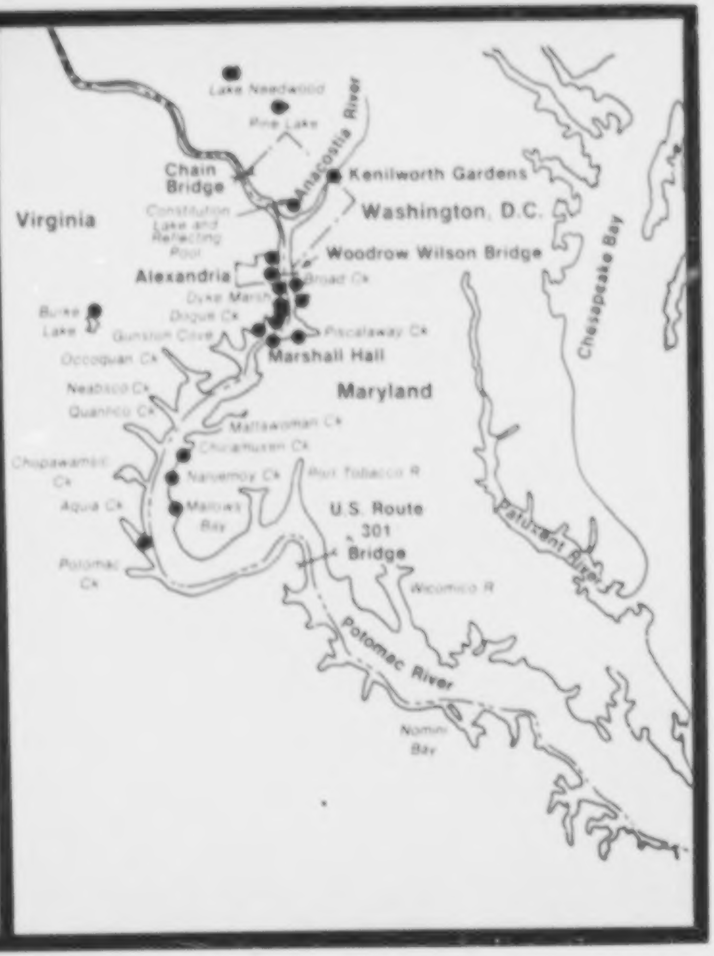
Tests were conducted with discharges over the dam up to 484,000 cfs, which is the maximum flood of record, and various tailwater elevations. Flow conditions did not improve when tests were conducted with the rubble dam removed or the end sill removed.

Two modifications to the dam were evaluated to solve the problem; one by placing 4- to 5-foot stone over the entire face of the dam and the other by pumping concrete into bags placed on the face of the dam. Both designs would be on a 1-vertical to 4-horizontal slope and both would eliminate the roller effect. The concrete-filled bag modification was selected since it does not involve rocks with jagged edges and would be safe in the event someone attempted to boat over the dam. This modification to the dam will cause a boater to remain on the river surface and not be pulled under by the vertical roller. The improvement is to protect boaters who ignore warnings of danger and not to encourage recreation at the dam.

As part of the detailed design, we are investigating the feasibility of incorporating fish passage provisions into the modification. With this action, we may be able to restore access to historical spawning areas for migrating fish in the Potomac River upstream of Little Falls Dam. This provision for fish passage, coupled with continued improvements in Potomac River water quality and specific actions by State and Federal fishery agencies to stock and monitor migratory species, will contribute to the goal of improving the Potomac River and the Chesapeake Bay at the same time as we accomplish the primary mission of public safety.

Plans and specifications for corrective measures are being prepared and are scheduled for completion on 28 June. Construction of the improvements is scheduled to begin in August and be completed in December. The estimated project cost is $3.4 million.

1984 Hydrilla Distribution


Lake Needwood
Pine Lake
Anacostia River
Chain Bridge
Kenilworth Gardens
Washington, D.C.
Virginia
Constitution Lake and Reflecting Pool
Woodrow Wilson Bridge
Alexandria
Broad Ck
Dyke Marsh
Dogue Ck
Burke Lake
Gunston Cove
Piscataway Ck
Marshall Hall
Occoquan Ck
Neabsco Ck
Maryland
Quantico Ck
Mattawoman Ck
Chicamuxen Ck
Chopawamsic Ck
Nanjemoy Ck
Port Tobacco R
Aquia Ck
Mallows Bay
U.S. Route 301 Bridge
Potomac Ck
Wicomico R
Patuxent River
Chesapeake Bay
Potomac River
Nomini Bay

Legend

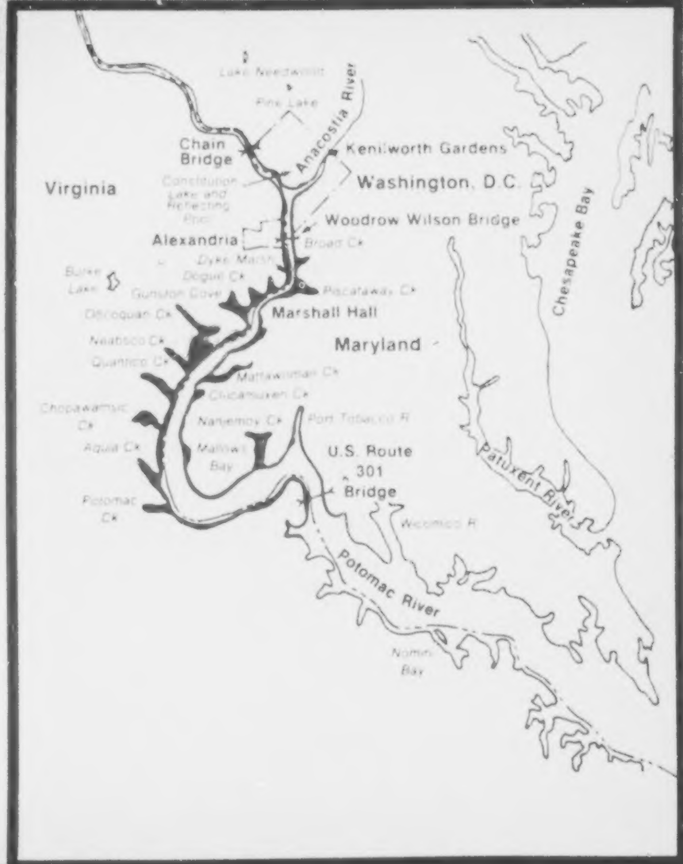
● Location of Hydrilla

1982 - 10 Acres

(Dyke Marsh Only)

1984 - 600 Acres

Potential Areas for Hydrilla Infestations by 1995


Lake Needwood
Pine Lake
Anacostia River
Chain Bridge
Kenilworth Gardens
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Virginia
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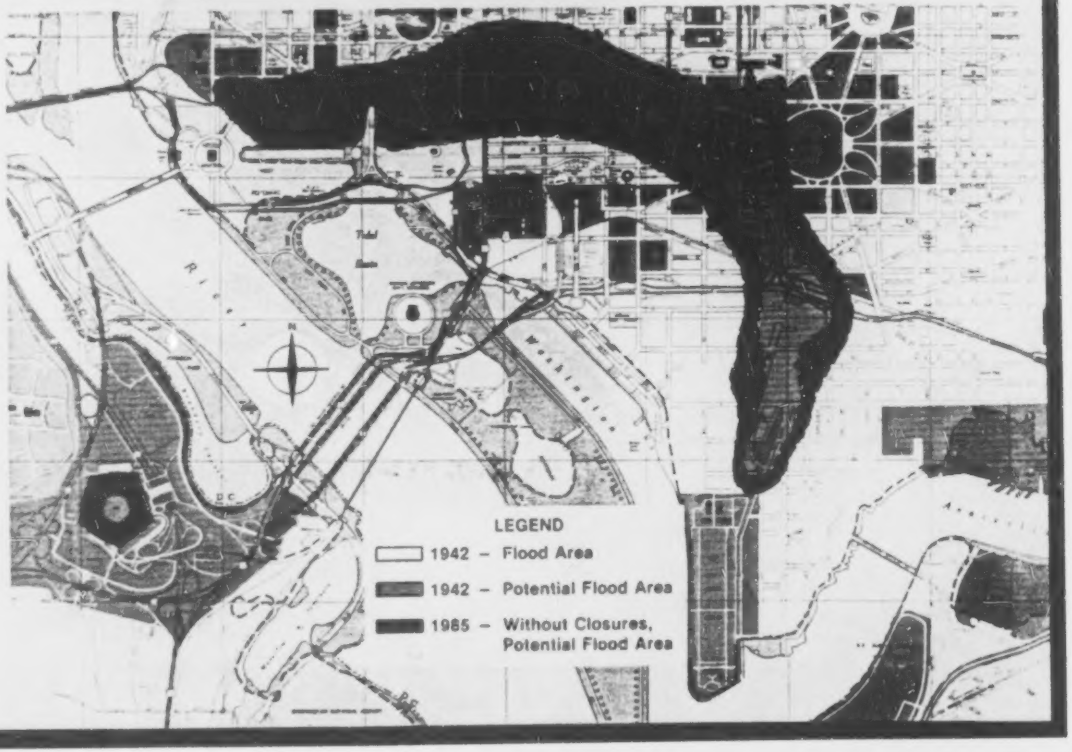
Port Tobacco R
Aquia Ck
Mallows Bay
U.S. Route 301 Bridge
Potomac Ck
Wicomico R
Potomac River
Nomini Bay
Patuxent River
Chesapeake Bay

Legend

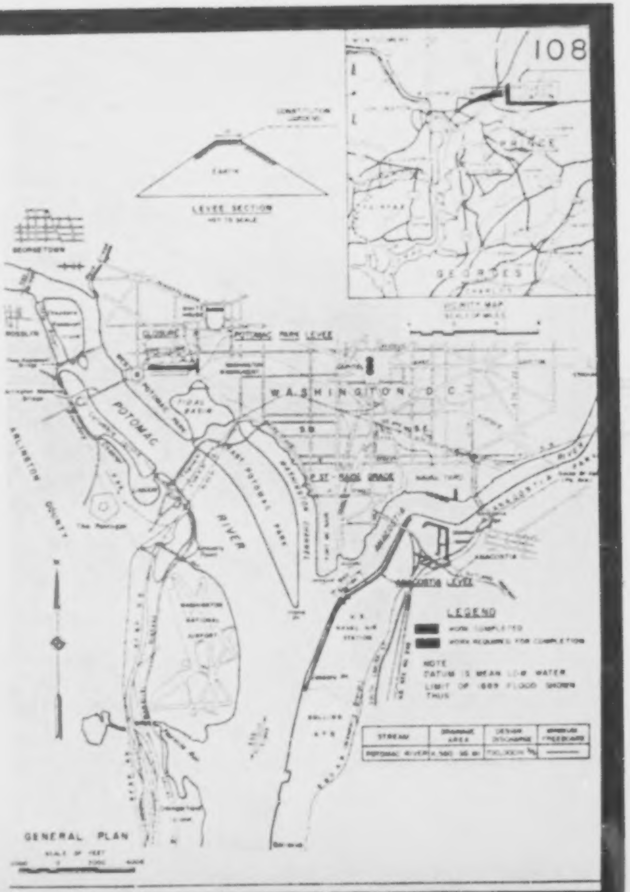
▬ Potential Location of Hydrilla

1995 - 34,000 Acres

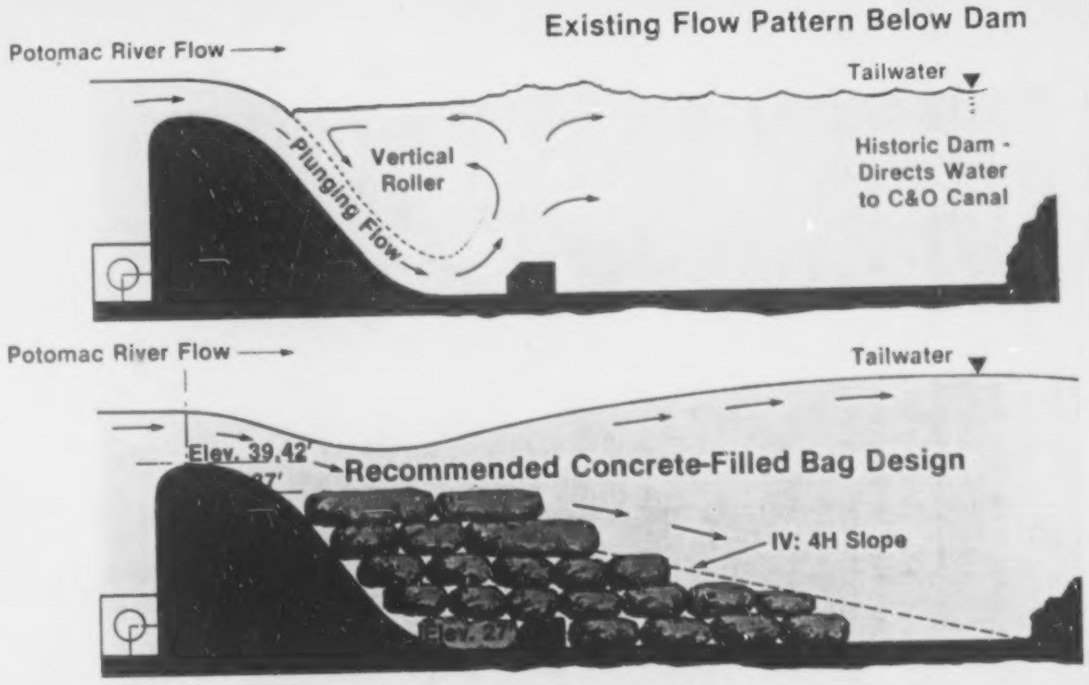
Washington, DC and Vicinity Local Protection Project


LEGEND
1942 – Flood Area
1942 – Potential Flood Area
1985 – Without Closures, Potential Flood Area
N
Washington
D.C.

Washington, DC and Vicinity Local Protection Project


108
LEVEE SECTION
EARTH
VICINITY MAP
GEORGETOWN
POTOMAC PARK LEVEE
WASHINGTON D C
POTOMAC
RIVER
EAST POTOMAC PARK
WASHINGTON CHANNEL
P ST - NAVE GRADE
ANACOSTIA LEVEE
ANACOSTIA RIVER
ARLINGTON COUNTY
WASHINGTON NATIONAL AIRPORT
U.S. NAVAL AIR STATION
BOLLING A.F.B.
LEGEND
WORK COMPLETED
WORK REQUIRED FOR COMPLETION
NOTE
DATUM IS MEAN LOW WATER
LIMIT OF 1889 FLOOD SHOWN THUS
STREAM
DRAINAGE AREA
DESIGN DISCHARGE
POTOMAC RIVER
GENERAL PLAN
SCALE OF FEET

Little Falls Dam Modifications



Existing Flow Pattern Below Dam

Recommended Concrete-Filled Bag Design

Potomac River Flow
Tailwater
Vertical
Roller
Plunging Flow
Historic Dam -
Directs Water
to C&O Canal
Potomac River Flow
Tailwater
Elev. 39.42'
37'
IV: 4H Slope
Elev. 27'

Mr. **Barnes**. Colonel, thank you very much.

Ms. Harrison, welcome to the subcommittee. We appreciate your being here this afternoon. We welcome your testimony.

STATEMENT OF VERNA HARRISON

Ms. **Harrison**. Mr. Chairman and subcommittee members, my name is Verna Harrison and I am an assistant secretary of the Maryland Department of Natural Resources. I am pleased to appear before the Subcommittee on Government Operations and Metropolitan Affairs at this oversight hearing on the state of the Potomac River in 1985, and to address the important issue of water safety.

I have prepared a formal statement, copies of which have been provided to the subcommittee, and I respectfully request that my formal statement be included in the hearing record.

Mr. **Barnes**. All of the prepared statements will be included.

Ms. **Harrison**. I would also like to inform the members of the subcommittee that with me today are three members of the department of natural resources who are instrumental in implementing our Potomac River policies. Sgt. Louis Ritter of the natural resources police who is boating safety officer of the State of Maryland, Isedora Ballard, chief of the Scenic and Wild Rivers Program, capital programs administration, and authority of our study on the recreational uses of the Potomac River, and Frank Dawson, a botanist and chief of the Submerged Aquatic Vegetation Program in the Tidewater Administration.

At this time, I would like to summarize the formal statement which I have submitted.

The ability to ensure safe use of the Potomac River is a goal that transcends any one jurisdiction or governmental entity. Fortunately, concern about the safety of the recreational use of the Potomac River is shared by elected officials such as yourself and many at the State and local level, by Federal and State government personnel and by private groups and individuals.

Cooperation among the jurisdictions has improved, but action must continue to increase citizen awareness of the hazards and to review enforcement and rescue capabilities. In this respect, I would like to put in focus the nature of the safety problems of the portion of the Potomac River from Georgetown to about Edwards Ferry; review what Maryland has done and is doing now to address the safety issue, and make a few suggestions on improvements.

Although many of you are intimately aware of the geography of the Potomac River, and the TV worth a thousand words in describing what can be done in certain circumstances, I would like to briefly mention them to put into context Maryland's actions.

The area of the Potomac River which is most heavily used for recreational purposes is the 30-mile stretch extending from Georgetown to Edwards Ferry. This is one of the most beautiful parts of the Potomac River.

However, these same attractions make this stretch of the water the most treacherous. This is the area where most of the fatal accidents have occurred—where the turbulent white water is extremely powerful and the current can be deceptively swift.

Within those 30 miles of river distance are almost 200 miles of shoreline, much of which is within the Federal park system and therefore open for public enjoyment. Public interest in the resource is enormous. In 1984, 5,529,200 visits were made in this 30-mile segment of the river. By the end of April of this year, 1,199,822 people enjoyed the same areas representing a 3-percent increase over the same period last year.

The statistics on fatal accidents in this area of the river are well known; 11 died in 1984, 5 of which were involved in 1 accident, and 4 have died thus far this year. In 1982, a professor at American University conducted for the National Park Service an analysis of the drownings from 1975 to 1982 detailing the factors associated with each and a profile of the persons who drowned in the 8-year period. Very briefly, the vast majority died in accidents associated with the Brookmont Dam and surrounding rapids. Other significant groupings of fatalities involved swimmers and rock climbers. The results of this analysis contained in my formal statement, have assisted both the National Park Service and the natural resources police in targeting accident preventional efforts.

The continuing difficulty, clearly set forth by both the analysis of the recreational use of the Potomac River and the fatalities, is the increased use of the Potomac River by a large and partially transient population and the resultant strain on the monitoring and enforcement capabilities of both the natural resources police and the National Park Service. Quite clearly, the influx of over 5 million visitors in an area 30 miles long with almost seven times the shoreline when access from islands is taken into account, underscores the potential for danger.

In attempting to address the safety problems associated with the geographical characteristics of the Potomac River and the amount of recreational use, the efforts of the State of Maryland have been directed in two major areas: First prevention measures ranging from education programs to use restrictions, and second, enforcement and rescue.

The natural resources police have an excellent program of boating safety education. Boating safety courses are available to persons for home study and to groups for formal classroom sessions. The natural resources police educational presentation includes the film, "The Drowning Machine," and literature explaining the importance of safety.

In addition, the natural resources police have responded to requests for the educational program generated by the letter sent last year by Representatives Barnes, Hoyer, Parris, Wolf, and Fauntroy which informed many groups about the availability of these programs.

Over the last several years, the natural resources police have conducted annual workshops on water and boating safety instructions for public and private school teachers. The 1982 and 1983 workshops were provided for teachers with the goal of enabling them to undertake this kind of instruction in their schools. In Montgomery County such a program was undertaken at the W.H. Farquhar Middle School. In 1984 the workshop focus was on volunteer boating safety instructions. This summer, two more workshops will be held for such volunteers.

Following the tragic drownings at Little Falls last year, natural resources police participated in two television programs which discussed the problems inherent in much of the Potomac River. These news shows were very helpful, presenting the safety and accident prevention issues in a most thorough fashion. Perhaps a continuation of such programs this spring and over the summer as part of a publicity/educational endeavor would be possible and certainly this department would support and participate in them. Funds have been identified to adapt Virginia's boating safety TV spots to Maryland.

Maryland has boating regulations which address specific river safety areas. For example, every person floating the white water portion of any designated stream segment is required to wear a U.S. Coast Guard approved personal floatation device at all times, have grab loops or safety lines attached to the vessel, and wear a safety helmet while using a decked vessel. All of these regulations apply to the Potomac River.

We have prohibited boating from within 200 yards upstream of the Potomac Edison Dam at Williamsport. We are now in the process of promulgating a new regulation which would prohibit boating within a certain distance—100 to 200 yards—of other dams on the Potomac River, including the Brookmont Dam and the Great Falls Aquaduct Dam. When the regulations are finalized public hearings will be scheduled.

The natural resources police are also undertaking a more visible warning program. The natural resources police are developing warning signs for all the dams on the river as well as educational and warning signs addressing white water stream segments, skill levels, and equipment requirements. These signs will be posted on State, Federal, county, municipal properties, and on private properties where permission is granted.

As I mentioned earlier, analysis of use and fatalities has directed Maryland's response to the safety problem. It appears that one of the new steps that should be examined in the need to restrict swimming in certain of the more dangerous portions of the Potomac. This must be accomplished by State statutory action and the department will explore this issue with the Attorney General.

Mr. Chairman, cooperation among the jurisdictions has improved in the last several years. In addition to the National Park Service efforts, I would like to take this opportunity to acknowledge two actions being taken by the Federal Government which are significant. We commend the efforts of the Corps of Engineers in undertaking changes in the hydraulics of the Brookmont Dam which should be an important step to reduce fatalities.

In addition, on February 6, 1985, the department was informed by Col. Winton G. Campbell, Jr., General Staff President, Armed Forces Disciplinary Central Board that the area of Sycamore Island to Chain Bridge is now off limits to all military personnel. I would appreciate it if this copy of the letter from Colonel Campbell to natural resources police commander, Roy Rafter, be entered in the record. Copies have been provided to your staff.

[The letter of Colonel Campbell follows:]

DEPARTMENT OF THE ARMY
HEADQUARTERS US ARMY MILITARY DISTRICT OF WASHINGTON
FORT LESLEY J. McNAIR
WASHINGTON, DC 20319

REPLY TO
ATTENTION OF

6 FEB [illegible]

Deputy Chief of Staff for
Operations, Plans and Security

Superintendent
Natural Resource Police
Tawes State Office Building
Annapolis, Maryland 21401

Dear Sir:

As President of the Armed Forces Disciplinary Control Board, it is my duty to inform you that the area on the Potomac River from the warning signs posted near Sycamore Island (approximately .4 miles north of Little Falls Dam) to Chain Bridge has been declared off limits to personnel of the Armed Forces, effective immediately. (See attached map.)

This action is the result of the drownings which occurred in the vicinity of Little Falls Dam (Brookmont Dam) in May 1984. The dam and surrounding waters are considered a danger to the health and welfare of our service members. Consequently, you are advised that, in accordance with established policy of the Armed Forces, this restriction will remain in effect for an indefinite period. The restriction may be recommended for removal by the board if satisfactory corrective measures have been adopted.

Military personnel are prohibited from entering this area as long as this order is in force.

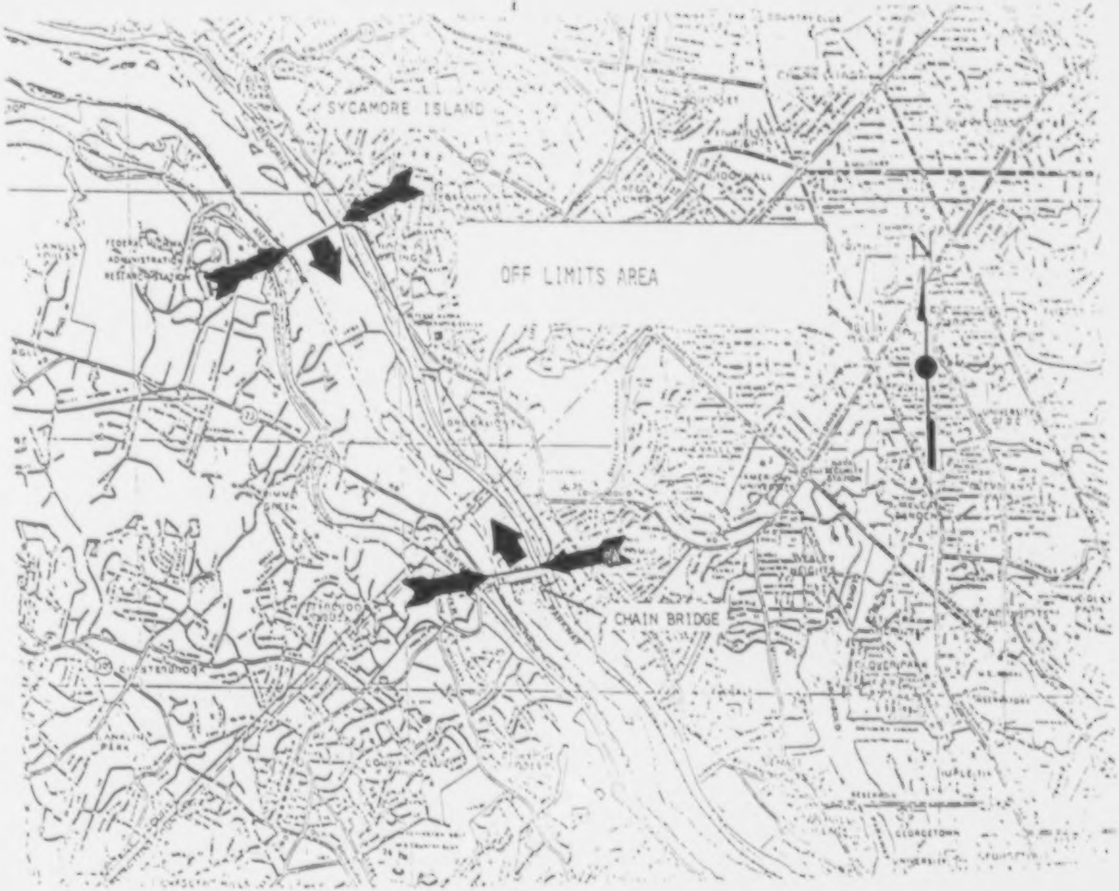
Inquiries pertaining to this action may be submitted, by mail, to the President, Armed Forces Disciplinary Control Board, or by calling my point of contact, Captain Essig, 475-0550/0554.

Sincerely,

Winton G. Campbell, Jr.

Winton G. Campbell, Jr.
Colonel, General Staff
President, Armed Forces
Disciplinary Control Board

Enclosure


N
SYCAMORE ISLAND
OFF LIMITS AREA
FEDERAL HIGHWAY ADMINISTRATION RESEARCH STATION
CHAIN BRIDGE
GEORGETOWN

Having discussed measures that have been taken or are planned to impose restrictions vitally important for the safety of the users of this section of the Potomac River, I would like to address a means of enhancing ability to enforce these restrictions by augmenting the authority of the National Park Service rangers. Because so much of the land along the dangerous sections of the Potomac River is National Park Service property it is frustrating and at best inefficient to have these trained personnel without the necessary enforcement power to compel violators to obey existing restrictions on at least the subject 30-mile portion of the Potomac River.

This matter of concurrent jurisdiction is an issue that has been recommended this winter by the Metropolitan Area Council of Governments or CSG. Preliminary research indicates that the National Park Service rangers can be given the authority to enforce Maryland regulations or given the ability to promulgate regulations identical to Maryland's for National Park Service enforcement.

Our discussions with subcommittee staff in this area lead us to believe that appropriate legislation can be crafted to establish such authority. We will be working further in this area as well as determining what legislation may be required from the Maryland General Assembly, which meets in early January.

More resources would be helpful to address the safety issues both in terms of greater educational program effort and patrol and response manpower. We are preparing requests for additional funds to support better outreach efforts, particularly for schools and community groups. Funds may be sought to provide for one additional response team in the natural resources police central region, which includes the upper Potomac River area. It should be emphasized, however, that it is our belief that public education and awareness are far more important than additional patrol manpower, particularly on this section of the Potomac River where patroling is inhibited by the physical characteristics of the river.

In 1983, the department of natural resources provided radios to the National Park Service which enhanced communications capabilities. In a further effort to improve coordination, and communication procedures among local police and fire departments, the Virginia Game and Fish Commission, natural resources police, and National Park Service are being reviewed. The possibility of standardizing radio frequency among other parties is an area which will be explored. In this respect, the subcommittee should be aware that we are working with National Park Service on a meeting at which time rescue and other jurisdictional problems on the river are to be further addressed.

The subcommittee should also be aware that the American Canoe Cruisers Association and the National Park Service are holding a river safety symposium at the Virginia side of the Great Falls area on June 14 and 15, and all involved jurisdictions will be attending. The purpose of this workshop is to enhance white-water rescue skills.

In my formal statement, I have gone into some detail about Maryland's activities relating to the water quality of the Potomac River. This panel does not have that issue, but I thought it would be helpful to the subcommittee if that information was provided.

Mr. Chairman, I would like to commend you and the subcommittee for holding these hearings. The safe use of the Potomac River is an important issue and it is important that we strive to find the balance between the use of the river and any steps taken to limit or restrict its use for reasons of safety. The hearings today are even more significant because they provide a valuable opportunity for all to better understand these problems and to enhance public awareness of the avoidable dangers of the river. I am pleased to be here and would be happy to answer any questions you and the members of the subcommittee may have.

Mr. Barnes. Thank you very much, Ms. Harrison.

[The prepared statement of Ms. Harrison follows:]

STATEMENT OF VERNA HARRISON
ASSISTANT SECRETARY, MARYLAND DEPARTMENT OF NATURAL RESOURCES

OVERSIGHT HEARINGS ON THE STATE OF THE POTOMAC RIVER, 1985

May 29, 1985

Mr. Chairman and Subcommittee members, my name is Verna Harrison and I am Assistant Secretary of the Maryland Department of Natural Resources. I am pleased to appear before the Subcommittee on Government Operations and Metropolitan Affairs of the House Committee on the District of Columbia at this oversight hearing on the state of the Potomac River - 1985 and to address the important issue of water safety.

The concern about the safety of the recreational use of the Potomac River has increased tremendously in the last several years. The Potomac River has attracted more and more citizens from the jurisdictions through which it flows because of several important, self-evident factors: the river is beautiful, its water quality has been improved, a greater variety of leisure time activities may be engaged in and there has been a steady increase in the number of people who can avail themselves of the sheer enjoyment which the river offers. So compelling is the attractiveness of the Potomac that those responsible for its safe use are faced with the harsh and tragic reality of drownings resulting from activities in the river some of which are frenetic and others, unfortunately, quite unwise.

The State of Maryland is working with the public officials from Maryland, Virginia, the District of Columbia and the federal government to provide recreational opportunities which are as safe as we can make them and to educate the public about the risks that attend certain activities or certain areas of the River.

The safety problem is one for all jurisdictions to solve. Cooperation among the jurisdictions has improved; but action must continue to increase citizen awareness of the hazards and to improve the efficiency of rescue procedures. In this respect, I would like to put in focus the nature of the safety problems found in the Potomac River specifically in the area of the River from Georgetown to about Edwards Ferry, review what Maryland has done and is doing now to address the safety issue, and to make a few suggestions on improvements.

The area of the Potomac River which is most heavily used for recreational purposes and where most fatal accidents have occurred is the area extending from Georgetown (Mile 0) to about Left Lock 25 (Mile 30), a thirty mile stretch of the River. This is one of the most beautiful parts of the Potomac. It contains islands, the Great Falls and Mather Gorge area, large and small rapids where the turbulent white water is extremely powerful, areas of still water where fishing is very good, many scenic areas where rocks abound attracting, unfortunately, those who scramble about them (particularly the young) and on hot days the lure of refreshing waters for swimming.

Within this thirty mile of river distance are almost 200 miles of shoreline much of which is within the federal park system and therefore open for public enjoyment. In addition, there are two dams: one at Brookmont near the District of Columbia, and the Great Falls Aquaduct Dam. These dams were constructed many years ago by the Corps of Engineers for water supply purposes. The Brookmont dam has been the scene of most of the drownings that have occured in this area.

In 1984, 5,529,200 visits were made in this 30 mile segment of the River. By the end of April of this year 1,199,822 people enjoyed the same area representing a 3% increase over the same period last year. The National Park Service (NPS) figures mirror projections made by the Maryland Department of Natural Resources (DNR) in the study entitled"Recreational Use of the Upper Potomac River" (1979) prepared by the Land Planning Services of the DNR Capital Programs Administration. That study details the increases in water related recreational activity i.e. swimming, canoeing, kayaking, bank fishing, small boat fishing, high speed power boating and water skiing in the last several years. Without further exposition here, the study determined what we all now know - that these many and varied uses pose management problems.

In 1984, 11 people drowned in this area, ie from Mile 0 to Mile 30. Included in these deaths, according to the NPS, were the 5 who drowned at Little Falls while rafting in disregard of warnings, one who was wading while fishing near Little Falls, two who entered the river from the Virginia side - one of which was from an undetermined cause and one from canoeing, another one of undetermined cause and two boys jumping on rocks near Chain Bridge. Thus far, in 1985 4 drownings have occurred: one fisherman near Chain Bridge, a college youth attempting to swim from Virginia to Maryland, one dip-netter, and one of undetermined cause.

In 1982, an analysis of drownings in the Potomac River was undertaken for the Park Service by Howard E. McCurdy, a professor at American University. This study was made available to our Natural Resources Police (NRP). The study analyzed 39 drownings from 1975 to 1982 from both sides of the Potomac and C&D Canal from immediately above Great Falls to Georgetown. Suicides were not included in the study. Dr. McCurdy concluded that there are four factors associated with drowning incidents: time of year, water level, wheather and day of the week. The specific conclusions were as follows:

1. Proportionately more drownings occur in the spring than in the summer. In the period studied, 24 or two-thirds occurred between April 1 and June 25; 12 occurred from June 26 to Labor Day; and only 3 occurred after Labor Day to the end of March.

2. Water level is a powerful predictor of drownings. More drownings occurred when the water level was between 3.4 feet and 5.2 feet.

3. In the spring, drownings are 3.5 times more likely to occur on weekends than on weekdays. In the summer, it evens out.

4. Drownings are 11 times more likely to occur on a sunny day in the summer than on a cloudy day (for what would appear to be obvious reasons).

Dr. McCurdy also undertook an analysis of the profiles of persons who drowned in the eight year period and concluded the following:

1. The typical swimmer who drowns is a 16 to 19 year old male.
2. The typical boater who drowns is 22 years old and male.
3. One-third of the drownings occur among hikers, rock hoppers, sunbathers and fishermen age 5 to 74 years but most are between 19 and 30 years of age and male.
4. People in boats tend to drown more often in the spring than do swimmers (probably because of water temperature).
5. Rock hoppers, sunbathers, hikers or fishermen are twice as likely to drown in the summer than in the spring.
6. Drownings by boat tend to occur in specific areas: 8 of the 11 boaters who drowned between 1975 and 1982 were lost between Brookmont Dam and Little Falls.
7. Swimmers made up 38% of the drownings, 33% were hikers, rock hoppers, sunbathers and fishermen on shore. In the early spring, nearly all these groups came from the Maryland side; in June the Virginia drownings begin to

increase and after June 25 the Virginia side predominates.

An assessment of the impact of publicity on drowning incidents was also undertaken by Dr. McCurdy. It was determined that a relationship between publicity and drownings may exist i.e. that where there was more publicity about drownings which occurred in the spring, there followed fewer summer drownings. It should be noted that Dr. McCurdy cautioned that the data in this area was not altogether conclusive.

In addition, Dr. McCurdy recommended that more careful records of all drownings be kept, that other factors such as intoxication, publicity and crowd size be measured in terms of their impact on drownings, and that the work of the NPS's River Safety Team be evaluated to assess which of their activities - patrol, rescue, or education have the greatest impact.

The study undertaken by Dr. McCurdy has been most helpful to both the Natural Resources Police and the Park Service rangers. The trends and relationships revealed in the study are being utilized to direct accident prevention and enforcement. The continuing difficulty has been, of course, the increased use of the Potomac River and the resultant strain on the monitoring and enforcement capabilities of both the NRP and the NPS. Quite clearly, the influx of over 5 million visits in an area 30 miles long with almost seven times the shoreline when access from islands is taken into account underscores the tremendous safety problems which face those of us charged with the responsibility to deal with these problems. The physical characteristics of the River are the reasons for the intense use and it is significant that fatalities have been as low as they have been, although any loss is too great.

In spite of the difficulties in trying to deal with the recreational use of the Potomac River, Maryland has undertaken a substantial effort to address the safety problems. Our efforts have been directed in three areas: boating safety education, warnings, and rescue.

The Natural Resources Police have a very fine program of boating safety education. Boating safety courses are available to persons for home study and to groups for formal classroom sessions. The NRP has worked with rod and gun clubs, civic groups, and groups such as the Boy and Girl Scouts to present information on safe boating. In addition, the NRP have responded to requests for the educational program genereated by the letter sent last year by Representatives Barnes and Wolf which informed many groups.about the availability of these programs. The NRP educational presentation includes the film "The Drowning Machine" and literature explaining the importance of safety.

Over the last several years, the NRP has conducted annual workshops on water and boating safety instruction for public and private school teachers. The 1982 and 1983 workshops were provided for teachers and the goal was to enable those teachers to undertake this kind of instruction in their schools. Such a program was undertaken at the W. H. Farquhar Middle School. In

1984 the workshop was for volunteer boating safety instructors. This summer, two workshops will be held for such volunteers - one in the Annapolis area and one in the Frederick County area.

Following the tragic drownings at Little Falls last year, NRP participated in two television programs which discussed the problems inherent in much of the Potomac and which presented the safety and accident prevention issues in a most thorough fashion. Perhaps a continuation of such programs this spring and over the summer as part of a publicity/educational endeavor would be possible and certainly this Department would support and participate in them.

Maryland has boating regulations which address specific river safety areas. Every person floating the white water portion of any designated stream segment is required to wear a U.S. Coast Guard approved type I, II, III or IV personal floatation device (PFD) at all times, have grab loops or safety lines attached to the vessel at all times and wear a safety helmet while using a decked vessel. All of these regulations apply to the Potomac River.

In addition to these regulations, we have prohibited boating from within 200 yards upstream of the Potomac Edison Dam at Williamsport. We are now in the process of promulgating a new regulation which would prohibit boating within certain distance (100 to 200 yards) of other dams on the Potomac River including the Brookmont Dam and the Great Falls Aquaduct Dam. On May 23, the Department's Boat Act Advisory Committee expressed its support for this proposed regulation and appointed a subcommittee to work in furtherance of the regulations. When the regulations are finalized public hearings on them will be scheduled.

The Natural Resources Police are also undertaking a more visible warning program. The NRP is developing warning signs for all the dams on the river as well as educational and warning signs addressing white water stream segments, skill levels and equipment requirements. These signs will be posted on state, federal, county, municipal properties and on private properties where permission is granted. In addition, as I as am sure the Corps of Engineers and the NPS will testify, these agencies have also planned to post additional warning signs.

Cooperation among the various jurisdictions in the area of water safety has improved in the past several years. In a further effort to improve cooperation, communication procedures among local police and fire departments, the Virginia Game Commission, NRP and the NPS are being reviewed. In 1983 the Department of Natural Resorces provided radios to the NPS which enhanced communication capabilities. The possibility of standardizing radio frequency among other parties is an area which will be explored. In this respect, the Subcommittee should be aware that we are working with NPS on a meeting at which time rescue and other jurisdictional problems on the River are to be further addressed. The Subcommittee should also be aware that the American Canoe Cruisers Association and the National Park Service are holding a River Safety Symposium at the Virginia side of the Great Falls area on June 14 and 15. The purpose of this workshop is to enhance white water rescue skills. All involved jurisdictions will be attending and it is our intention that appropriate NRP personnel will receive the benefit of this workshop.

Maryland will be doing more to address the water safety problems on the Potomac. I have already mentioned the proposed regulation concerning the dams. Additional authority for the National Park Service rangers to enforce safety regulations including those discussed above is being pursued. The increase in enforcement authority is necessary since the NPS controls so much of the land access to the River.

Preliminary research has been undertaken on this concurrent jurisdiction question and it is our position that the NPS rangers should be given the authority to enforce Maryland regulations or given the ability to promulgate regulations identical to Maryland's for NPS enforcement. Our discussions with Subcommittee staff in this area lead us to believe that appropriate legislation can be crafted to establish such authority. We will be working further in this area as well as determining what legislation may be required from the Maryland General Assembly which meets in early January.

Finally, we believe that more resources are required to address the safety issues both in terms of greater educational program effort and patrol and response manpower. We are preparing requests for additional funds to support better outreach efforts particularly for schools and community groups.

Funds are also being sought to provide for one additional response team in the NRP Central Region which includes the Upper Potomac River area. It should be emphasized however, that it is our belief that public education and awareness are far more important than additional patrol manpower particularly on this section of the Potomac where patroling in inhibited by the physical characteristics of the River.

Mr. Chairman, I believe that it would also be helpful to the Committee to hear about the significant effort Maryland is making in the area of the water quality of the Potomac River and also to know about Maryland's activities with respect to hydrilla - a submerged aquatic plant.

In addition to the development of the Chesapeake Bay initiatives for which program funding will affect Potomac River living resources and water quality, Maryland participates in the coordinated Regional Potomac Monitoring Program, which is composed of the Commonwealth of Virginia and Virginia local jurisdictions, and which monitors the water chemistry of the Potomac River. This program invloves monitoring the River's salinity, dissolved oxygen, ph, temperature and water clarity and conductivity. The Office of Environmental Programs of the Maryland Department of Health and Mental Hygiene is our participating state agency and conducts this monitoring on a monthly basis from March to October in the entire River. The purpose of this water quality monitoring effort is to ascertain both the water quality trends and, most importantly, to determine how water quality improvement efforts are working.

In addition, Maryland and the District of Columbia entered into the Anacostia Watershed Restoration Strategy. The agreement is designed to control sources of pollution to the Anacostia and to restore water quality to a level sufficient to support a balanced aquatic community. The restoration activities are focused on identification and elimination of all seweage overflows and discharges into the river and to control erosion and sedimentation. The Department is identifying sources of sediment so that better enforcement of sediment control laws can be improved.

With respect to hydrilla, both Maryland and Virginia are in agreement that the presence of this submerged aquatic vegetation (SAV) is an indicator of the Potomac River's improved water quality. SAVs are important to any estuary's overall health inasmuch as SAVs - including hydrilla - offer protective habitat for small fish, crabs and snails, important food sources for waterfowl and aquatic mammals and oxygen through photosynthesis for bottom waters. In this respect, the Environmental Protection Agency`s Bay Study determined that SAVs are a critical indicator of the overall health of the Chesapeake Bay and its tributaries and indicated that the decline of the submerged grasses coincided with the decline of the Bay's water quality.

Maryland does recognize that hydrilla can be a nuisance to boaters and shoreline property owners. We are funding a 2 year research effort to determine hydrilla's ability to compete with native SAVs at various salinity and nutrient levels. This is being coordinated with other research being conducted by the Corps of Engineers and U.S. Geological Survey. Maryland has participated in the Hydrilla Regional Action Committee which seeks to determine whether there are management actions which can be taken.

Maryland also strongly supports the Corps of Engineers' current study of management alternatives. While we oppose the use of chemicals to manage and control hydrilla, we do believe that cutting hydrilla from piers, channels, and moorings is appropriate so long as such cutting is reviewed to assure that it does not involve other SAVs and that particles of hydrilla are not scattered around so that it spreads further. We are prepared to work with any communities or marinas to ascertain how the problems caused by hydrilla can best be mitigated.

Mr. Chairman, I would like to commend you and the Subcommittee for holding these hearings. The safe use of the Potomac River is an important issue. Assuring the safety of over 5 million users of the River for a 30 mile stretch is difficult particularly when 4 jurisdictions are affected. These hearings today will help greatly in the effort to achieve this difficult but necessary goal. I therefore am pleased at the opportunity to testify and would be happy to answer any questions the members of the Subcommittee may have.

Mr. **Barnes**. Mr. Fish, welcome.

STATEMENT OF MANUS J. FISH, JR.

Mr. **Fish**. Mr. Chairman, and members of the committee, I appreciate the opportunity to appear before you to present the National Park Service's views on safety issues and water quality of the Potomac River. While the District of Columbia and the State of Maryland exercise sovereign jurisdiction over the river, the Federal Government through the National Park Service exercises jurisdiction over much of the shoreline along the 40 river miles in the Washington metropolitan area.

The role which the National Park Service has undertaken with regard to river safety is defined in large part by the following observations:

First, most river-related emergencies occur when individuals enter the river from park property.

Second, park personnel and equipment have immediate access to the river.

Third, we have the opportunity for contacting the visitors prior to their entering the river through the use of signs and visual aids, direct contact by employees with safety warnings, and through law enforcement.

We believe the greatest success can be found in contacting and informing our visitors concerning river hazards. This is where we place our greatest emphasis.

The likelihood of a successful river rescue diminishes substantially with each passing second that the individual is in the water. Even when the incident is reported immediately, the time to get personnel and equipment on location can range from 5 to 30 minutes.

Police helicopters have proven to be tremendously effective in rescuing potential drowning victims. However, these are not a panacea. Park staff is often the first to receive information concerning the need for a river rescue, and we have rangers who are equipped to give initial aid. Presently, we have two three-member safety teams which are physically located at the Great Falls parks in Maryland and Virginia. The members of these teams receive intensive training in river rescue, zodiac type boat operations, rock climbing, rigging, and emergency medical skills.

Our primary effort is focused on prevention, using cautionary and educational signs, frequent foot patrols, and a law enforcement presence by both our rangers and our police officers. We have instituted foot patrols of the shorelines in risk areas and this year will increase ranger/police patrols of the shoreline by zodiac-type boats.

When an emergency arises, rangers and park police work as a team and coordinate their efforts with the responsible local jurisdiction upon their arrival at the scene.

Most recently, we have been using a computerized statistical analysis of previous accidents, developed with the assistance of Prof. Howard McCurdy of American University, as a management tool for improved allocation of our resources. With a better understanding of events leading up to drownings, we have undertaken a much more active role by providing intensified area patrols and preventive rescues at predicted times of high risk or probability of drownings. These preventive rescues include removing visitors from dangerous locations, by using park staff and our helicopter with its "Billy Pugh net," before the visitors are critically threatened. We have had 25 rescues already this year.

Our ranger and police officers coordinate their efforts with those of the States, counties, and city emergency response agencies. To date, this has included coordination with all of the rescue organizations that have primary responsibilities for river rescue activities. With all of the efforts I have described, by this agency and others, we still have not been able to eliminate all of the deaths, but we are convinced that our joint surveillance and communication efforts have kept deaths to a minimum.

I would like to commend Assistant Secretary Harrison on the swimming regulations on this particular section of the river. We would be strongly supportive of that swimming regulation and certainly more cooperation in law enforcement aspects.

I would be pleased to try to answer any questions, Mr. Chairman.

[The prepared statement of Mr. Fish follows:]

STATEMENT OF MANUS J. FISH, JR., REGIONAL DIRECTOR, NATIONAL CAPITAL REGION, NATIONAL PARK SERVICE, DEPARTMENT OF THE INTERIOR BEFORE THE SUBCOMMITTEE ON GOVERNMENT OPERATIONS AND METROPOLITAN AFFAIRS OF THE HOUSE COMMITTEE ON THE DISTRICT OF COLUMBIA CONCERNING THE STATE OF THE POTOMAC RIVER - 1985.

MAY 29, 1985

[MR. CHAIRMAN AND MEMBERS OF THE COMMITTEE, I APPRECIATE THE OPPORTUNITY TO APPEAR BEFORE YOU TO PRESENT THE NATIONAL PARK SERVICE'S VIEWS ON SAFETY ISSUES AND WATER QUALITY OF THE POTOMAC RIVER. WHILE THE DISTRICT OF COLUMBIA AND THE STATE OF MARYLAND EXERCISE SOVEREIGN JURISDICTION OVER THE RIVER, THE FEDERAL GOVERNMENT THROUGH THE NATIONAL PARK SERVICE EXERCISES JURISDICTION OVER MUCH OF THE SHORELINE ALONG THE 40 RIVER MILES IN THE WASHINGTON METROPOLITAN AREA.]

IT IS FAIR TO SAY THAT EVERY CONCEIVABLE RECREATIONAL USE OF THE RIVER AND ITS BANKS TAKES PLACE IN OUR PARKS OR IN THE RIVER. UNFORTUNATELY, MANY ACTIVITIES ARE UNDERTAKEN AT INAPPROPRIATE LOCATIONS BY INEXPERIENCED OR OVERLY ADVENTUROUS INDIVIDUALS. THUS, THE UNFORTUNATE STATISTICS OF DEATHS AND INJURIES HAVE EVOLVED. AS YOU KNOW, MR. CHAIRMAN, WE HAD 12 ACCIDENTAL DROWNINGS IN THE POTOMAC LAST YEAR, AND 4 SO FAR THIS YEAR.

THE NATIONAL PARK SERVICE ADMINISTERS LAND BORDERING THE RIVER FROM CUMBERLAND TO PISCATAWAY IN MARYLAND (208 MILES), FROM GREAT FALLS TO MOUNT VERNON ALONG THE VIRGINIA SHORE AND ALONG BOTH SIDES OF THE RIVER IN WASHINGTON, D.C. THE PARKS MOST INVOLVED WITH RIVER SAFETY, DUE TO THEIR PROXIMITY TO DANGEROUS STRETCHES

OF THE RIVER, INCLUDE THE C&O CANAL NATIONAL HISTORICAL PARK, GREAT FALLS, VIRGINIA, AND THE GEORGE WASHINGTON MEMORIAL PARKWAY.

WITH THE RIVER UNDER THE JURISDICTION OF THE STATE OF MARYLAND AND THE DISTRICT OF COLUMBIA, THE ROLE WHICH THE NATIONAL PARK SERVICE HAS UNDERTAKEN WITH REGARD TO RIVER SAFETY IS DEFINED IN LARGE PART BY THE FOLLOWING OBSERVATIONS:

1. MOST RIVER-RELATED EMERGENCIES OCCUR WHEN INDIVIDUALS ENTER THE RIVER FROM PARK PROPERTY;

2. PARK PERSONNEL AND EQUIPMENT HAVE IMMEDIATE ACCESS TO THE RIVER; AND,

3. WE HAVE THE OPPORTUNITY FOR CONTACTING THE VISITORS PRIOR TO THEIR ENTERING THE RIVER THROUGH THE USE OF SIGNS AND VISUAL AIDS, DIRECT CONTACT BY EMPLOYEES WITH SAFETY WARNINGS, AND THROUGH LAW ENFORCEMENT.

WE BELIEVE THE GREATEST SUCCESS CAN BE FOUND IN CONTACTING AND INFORMING OUR VISITORS CONCERNINGT RIVER HAZARDS. THIS IS WHERE WE PLACE OUR GREATEST EMPHASIS.

THE LIKELIHOOD OF A SUCCESSFUL RIVER RESCUE DIMINISHES SUBSTANTIALLY WITH EACH PASSING SECOND THAT THE INDIVIDUAL IS IN THE WATER. EVEN WHEN THE INCIDENT IS REPORTED IMMEDIATELY, THE TIME TO GET PERSONNEL AND EQUIPMENT ON LOCATION CAN RANGE FROM 5 TO 30 MINUTES. THE STRONG RIVER CURRENTS CAN PULL THE VICTIM UNDER WITHIN SECONDS OF ENTRY INTO THE WATER. RARELY IS THE VICTIM ABLE TO GRAB ON TO SOMETHING TO HELP HIMSELF UNTIL ASSISTANCE ARRIVES.

AS HAS BEEN SO DRAMATICALLY PORTRAYED BY THE MEDIA, OUR UNITED STATES PARK POLICE HELICOPTERS HAVE PROVEN TO BE TREMENDOUSLY EFFECTIVE IN RESCUING POTENTIAL DROWNING VICTIMS; HOWEVER, THESE ARE NOT A PANACEA. PARK STAFF IS OFTEN THE FIRST TO RECEIVE INFORMATION CONCERNING THE NEED FOR A RIVER RESCUE, AND WE HAVE RANGERS WHO ARE EQUIPPED TO GIVE INITIAL AID. PRESENTLY, WE HAVE TWO 3-MEMBER RIVER SAFETY TEAMS WHICH ARE PHYSICALLY LOCATED AT THE GREAT FALLS PARKS IN MARYLAND AND VIRGINIA. THE MEMBERS OF THESE TEAMS RECEIVE INTENSIVE TRAINING IN RIVER RESCUE, ZODIAC-TYPE BOAT OPERATIONS, ROCK CLIMBING, RIGGING AND EMERGENCY MEDICAL SKILLS. AS A CASE IN POINT, MR. CHAIRMAN, SIX OF OUR RANGERS RECENTLY COMPLETED THREE FULL DAYS OF EXTENSIVE WHITEWATER TRAINING IN THE RAPIDS IMMEDIATELY BELOW GREAT FALLS. THEIR CONTINUOUS EFFORT TO MAINTAIN THEIR SKILLS THROUGH THEIR PRACTICAL TRAINING IN WHITEWATER RESCUE TECHNIQUES AS WELL AS THEIR EXPERIENCE GAINED IN EACH NEW RESCUE EFFORT IS IN ADDITION TO THEIR MORE ROUTINE PATROL FUNCTIONS, VISITOR ASSISTANCE, AND FIRST AID.

THE EFFORTS OF THE NATIONAL PARK SERVICE, WHICH SERVES AS INITIAL RESPONSE AND SUPPORT TO THE STATE AND COUNTY AGENCIES, HAVE HAD A MEASURABLE EFFECT ON THE NUMBER OF PEOPLE SUCCESSFULLY RESCUED. HOWEVER, OUR PRIMARY EFFORT IS FOCUSED ON PREVENTION, USING CAUTIONARY AND EDUCATIONAL SIGNS, FREQUENT FOOT PATROLS, AND A LAW ENFORCEMENT PRESENCE BY BOTH OUR RANGERS AND OUR POLICE OFFICERS. WE HAVE INSTITUTED FOOT PATROLS OF THE SHORELINES IN RISK AREAS AND THIS YEAR WILL INCREASE RANGER/POLICE PATROLS OF THE SHORELINE BY ZODIAC-TYPE BOATS. THE PATROLS PROVIDE INFORMATION TO FISHERMEN AND OTHER PARK VISITORS ON HOW TO STAY SAFE.

WHEN AN EMERGENCY ARISES, RANGERS AND PARK POLICE WORK AS A TEAM AND COORDINATE THEIR EFFORTS WITH THE RESPONSIBLE LOCAL JURISDICTION UPON THEIR ARRIVAL AT THE SCENE. PARK POLICE HELICOPTERS ARE USED FREQUENTLY AND UNDERTAKE WHAT CAN ONLY BE DESCRIBED AS HEROIC RESCUES. WE ARE CONCERNED SOMETIMES THAT THESE VALIANT EFFORTS BY OUR PARK PROFESSIONALS MAY BE VIEWED AS ROUTINE.

MOST RECENTLY, WE HAVE BEEN USING A COMPUTERIZED STATISTICAL ANALYSIS OF PREVIOUS ACCIDENTS, DEVELOPED WITH THE ASSISTANCE OF PROFESSOR HOWARD MCCURDY OF AMERICAN UNIVERSITY, AS A MANAGEMENT TOOL FOR IMPROVED ALLOCATION OF OUR RESOURCES. WITH A BETTER UNDERSTANDING OF EVENTS LEADING UP TO DROWNINGS, WE HAVE UNDERTAKEN A MUCH MORE ACTIVE ROLE BY PROVIDING INTENSIFIED AREA

PATROLS AND PREVENTIVE RESCUES AT PREDICTED TIMES OF HIGH RISK OR PROBABILITY OF DROWNINGS. THESE PREVENTIVE RESCUES INCLUDE REMOVING VISITORS FROM DANGEROUS LOCATIONS, BY USING PARK STAFF AND OUR HELICOPTER WITH ITS "BILLY PUGH NET", BEFORE THE VISITORS ARE CRITICALLY THREATENED.] ①

IN ADDITION TO THE EFFORTS INVOLVING PERSONNEL AND EQUIPMENT, WE ARE CONTINUING OUR EFFORTS TO WARN AND EDUCATE OUR VISITORS OF THE POTENTIAL DANGERS INVOLVED IN RECREATIONAL USE OF THE RIVER. ALSO, THE ONGOING EFFORTS OF THE CANOE CRUISERS ASSOCIATION, WHICH HAS PROVIDED MANY YEARS OF WHITEWATER CANOEING INSTRUCTION IN THE AREA, IS NOTED WITH OUR APPRECIATION. ADDITIONALLY, WE HAVE COORDINATED OUR EFFORTS WITH THE CORPS OF ENGINEERS TO WARN BOATERS ON THE RIVER WITH LARGE, RED-ON-WHITE SAFETY SIGNS UPRIVER OF THE LITTLE FALLS DAM. THESE SIGNS, WITH THE CORPS BUOYS, ARE A MAJOR STEP IN WARNING BOATERS ABOUT LITTLE FALLS. WE WANT TO THANK YOU, MR. CHAIRMAN, AND CONGRESSMAN WOLF FOR YOUR URGINGS ON THESE IMPORTANT SAFETY DEVICES.

WORKING TOGETHER IN THE FIELD AND THROUGH THE EFFORTS OF THE COUNCIL OF GOVERNMENTS, [OUR RANGER AND POLICE OFFICERS COORDINATE THEIR EFFORTS WITH THOSE OF THE STATES, COUNTIES AND CITY EMERGENCY RESPONSE AGENCIES. TO DATE, THIS HAS INCLUDED COORDINATION WITH ALL OF THE RESCUE ORGANIZATIONS THAT HAVE PRIMARY RESPONSIBILITIES FOR RIVER RESCUE ACTIVITIES.

WITH ALL OF THE EFFORTS I HAVE DESCRIBED, BY THIS AGENCY AND OTHERS, WE STILL HAVE NOT BEEN ABLE TO ELIMINATE ALL OF THE DEATHS. BUT, WE ARE CONVINCED THAT OUR JOINT SURVEILLANCE AND COMMUNICATION EFFORTS HAVE KEPT DEATHS TO A MINIMUM.

I WOULD LIKE TO COMMENT ON THE IMPROVEMENT OF WATER QUALITY OF THE POTOMAC RIVER. WE PARTICIPATE WITH THE METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS IN ROUTINE MONITORING OF WATER QUALITY OF THE RIVER AND IN COLLECTING SAMPLES FOR LABORATORY ANALYSIS. WE HAVE ALSO COOPERATED WITH THE U.S. GEOLOGICAL SURVEY, THE ARMY CORPS OF ENGINEERS, OTHER FEDERAL AGENCIES, AND THE STATES OF MARYLAND AND VIRIGINIA IN STUDYING AND MONITORING THE RECENT RESURGENCE OF SUBMERGED AQUATIC VEGETATION IN THE MID-POTOMAC. THE REMARKABLE REAPPEARANCE OF THESE PLANTS, WE FEEL, IS FURTHER INDICATION OF IMPROVED WATER QUALITY IN THE POTOMAC RIVER.

MR. CHAIRMAN, I SHALL BE PLEASED TO ANSWER ANY QUESTIONS THAT YOU OR ANY OTHER MEMBERS OF THE COMMITTEE MAY HAVE ABOUT THE NATIONAL PARK SERVICE'S VIEWS ON THE STATE OF THE POTOMAC RIVER.

Mr. BARNES. Thank you very much. All of the testimony was excellent.

Let me ask you all whether you feel that there might be some advantage in entering into a formal water safety agreement—Virginia, Maryland, District of Columbia, the Park Service—everybody agreeing in writting to what the responsibilities are and what action ought to be taken. Is that something that would be positive?

Mr. FISH. I think it would be very positive.

Ms. HARRISON. I agree. We have had a brief conversation about that. I think that would be very helpful.

Mr. BARNES. If there is a way that this committee can be helpful in pursuing that, I think it might be a very useful thing to do.

Is it possible that your already informal discussion can lead to a meeting? We can invite Virginia and the District of Columbia to get in on the act as well. I am sure Congressman Parris will be happy to help with the Virginia folks. Frank Wolf has been working with them already. Shall we try?

Mr. FISH. I think it is a very good idea and we would be delighted to participate.

Mr. BARNES. Great.

Mr. Fish, would you want to try to take the lead and pull people together?

Mr. FISH. I would be glad to do it.

Mr. BARNES. If you could call a meeting, I would be happy to attend, as I'm sure others would be. If we can get all the jurisdictions working together to expedite procedures for a safer river, it would be helpful.

Let me just ask a couple of questions out of ignorance. How do you report an incident on the river? If I am on the side of the river, the bank, and I see something dangerous happening out there, what do I do? Do I get to the phone and call 911?

Mr. FISH. Try to either do that, if there was a phone available, which there aren't many. Most probably head for the visitor's center if you are over in Maryland and see something in Virginia. That is what I was saying. It takes 5 minutes—it would be very quick if you could get some rescue equipment down to the water in 5 minutes. It depends on where the person is located, how long it takes them to get back to where they entered the park and get hold of a ranger. Of course the ranger puts the call out on 911 for additional help, then we would be——

Mr. BARNES. The ranger would use 911?

Mr. FISH. Yes, sir.

Mr. BARNES. So if a citizen did that, that would be the right thing to do, if there were a phone around?

Mr. FISH. Yes, sir; and then if it was the reverse, if they got to a phone, I am sure whoever was contacted on 911 would know enough to call the park and——

Mr. BARNES. Call in?

Mr. FISH. Yes, sir.

Mr. BARNES. One of the things that hasn't been mentioned today, was something that occurred some years back, when I was in the Marine Corps. I was stationed for a period of time down here at Quantico. This was in the late sixties. Some of you may remember the terrible tragedy, boating accident—this would have been about

1968 I guess, maybe the winter of 1968 or 1969, I would have to check—there was a war canoe being used in the training exercise by marines at the Marine Base at Quantico. There were—I forget how many Marines were on that canoe, but it was 11, or 13, or 15, I don't remember the exact number, but I remember the incident very, very well.

What happened in that incident was that the water was so cold that they were really killed—these were strong, young marines out there on a training exercise in the wintertime and the water was so cold that they were not able to swim once they got into the water. They weren't able to operate in the water even though many of them were excellent swimmers. Is that a problem that we run into? People get out on the river—that don't seem to have been a factor in these recent fatalities, but is that a continuing problem?

Mr. **Fish**. Well, I think it would be hypothermia and certainly that is a problem, but most of the drownings that occur, occur in warm water. That is the statistical analysis we have done—and I would be pleased to put the study in as part of the record if you would like it, Mr. Chairman, but would indicate——

Mr. **Barnes**. I think it would be helpful to have that in the record.

[The statistical analysis follows:]

PREDICTING AND PREVENTING FUTURE DROWNINGS IN THE POTOMAC RIVER:

A STATISTICAL ANALYSIS

A Report Prepared for
the U.S. National Park Service
C & O Canal N.H.P.

Dr. Howard E. McCurdy
Professor, The American University

September, 1982

Predicting and Preventing Future Drownings in the Potomac River

Howard E. McCurdy

Summary

In late June of 1982, following a series of three drownings over one three day period, C & O N.H.P. District Ranger Mike Brown asked me to conduct a statistical analysis of drownings in the Great Falls to Georgetown area. I had earlier volunteered my help as part of my sabbatical leave as a professor at American University.

We hoped at that time that the data might provide us with a formula for accurately predicting the days on which drownings are most likely to occur. We also hoped that an analysis of past drownings would suggest additional steps that could be taken to reduce the frequency of drownings in the river and canal.

As a result of the analysis, I can report the following conclusions:

1. The probability of a drowning occurring is statistically associated with four factors (time of year, water level, weather, and day of week). Using these four factors, it is possible to predict the probability of a drowning occurring on any given day.

2. The data reveal statistically significant patterns in the drownings. These patterns suggest additional steps that might be taken to further reduce the number of drownings each year.

Data for the analysis was drawn from the years since the formation of the River Safety Team (1975-1982). The report analyzes drownings from the area immediately above Great Falls up to but not including Georgetown. Thirty-nine drownings, from both sides of the Potomac River and in the C & O Canal, have occurred in that time (excluding apparent suicides).

I have not attempted to estimate or analyze the number of drownings that have been prevented as a result of the work of the River Safety Team, although methods are available to do this. As a result, the data in this report cannot be used to support any reduction in current rescue, patrol, and education work unless further analysis confirms that those efforts are ineffective in preventing drownings. What this report does do is point to additional steps that may be taken to prevent the drownings that still occur.

Predicting the Days on Which Drownings Occur

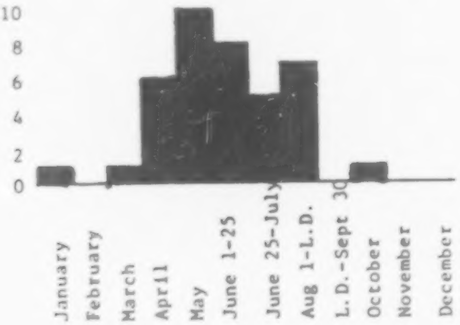
If the 39 drownings since 1975 had occurred randomly, then the probability of a drowning occurring on any given day could be stated as 1:75. In other words, one drowning could have been expected every 75 days.

The 39 most recent drownings, however, turn out not to be random. They are not as likely to occur on any one day as another. In fact, the probability of a drowning occurring varies from about 1:8 to about 1:700 depending upon the characteristics of the particular day and the statisical patterns. Those characteristics and patterns can be stated as four general rules.

Rule #1: Proportionately more drownings occur in the Spring than in the Summer. Since 1975, twenty-four or nearly two-thirds of the drownings have occurred in the 86 day period between April 1 and June 25. The 71 day period between June 26 and Labor Day has accounted for 12 drownings. Ninety percent of the drownings occurred in the Spring and Summer (April 1 to Labor Day). Only three drownings occurred after Labor Day through the end of March.

The attached chart shows the number of drownings per month. June 25 is used as the dividing point since this is the date by which all schools have begun the summer break. The data is complete through Labor Day, 1982.

NUMBER OF DROWNINGS BY MONTH
1975-1982



Rule #2. The most powerful predictor of drownings is water level. You are four times as likely to have a drowning occur when the river is running between 3.4 and 5.2 feet (Little Falls gauge) than when it is running higher or lower. The odds are most pronounced in the Summer; less so in the Spring.

Water levels also provide the most accurate predictor of the total number of drownings that will occur in any given season. The predictor is stated as a regression formula, as follows:

$Y_p = .7 + .04(x)$

Y_p = Expected number of drownings between April 1 and Labor Day in any given year.

x = Estimate of the number of days between April 1 and Labor Day that the water will run at middle levels (between 3.4 and 5.2 feet, Little Falls guage.

The formula is accurate within one drowning (plus or minus) for all but one of the past seven years. The only year which deviates significantly from the formula is 1975.

The formula was calculated based on data drawn from the years 1975 through 1981. During the last summer, District Ranger Mike Brown and I applied the formula to 1982. We estimated that the river would run at middle levels for 115 out of a possible 143 days. The formula predicted five drownings for the 1982 Spring/Summer season (the math is shown below). In fact, five occurred.

$Y_p = .7 + .04\ (x)$

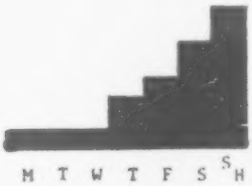
$Y_p = .7 + .04\ (115)$

$Y_p = 5.3\ (\pm\ 1)$

On the average, you can expect 84 mid-level days each year between April 1 and Labor Day. Eighty-four days is equal to 56 percent of the total season. The actual number of mid-level days varies widely, from a high of 126 in 1978 (seven actual drownings in the Spring and Summer) to a low of 34 in 1977 (one actual drowning in that period).

The larger number of mid-level days in the Spring explains in part why that season has a higher rate of drownings than the Summer.

Rule #3. In the Spring, drownings are 3.5 times more likely to occur on the weekends than on weekdays. In the summer, the number of drownings evens out over the week. (Holidays during the week are categorized as Sunday.)



DROWNINGS BY DAY OF WEEK: APRIL 1 - JUNE 25
1975-1982

Rule #4. In the Summer, drownings are eleven times as likely to occur on a sunny as on a cloudy day. In the Spring, the odds go down to 1:2. (A sunny day is defined as one on which the sun shines more than 3/5ths (61%) of the daylight hours.

As a rule of thumb, you can assume you have a highly dangerous situation:

WHEN THE WATER IS RUNNING BETWEEN 3.4 AND 5.2 FEET
ON A WEEKEND OR HOLIDAY IN THE SPRING
ON A SUNNY DAY IN THE SUMMER

Under these circumstances, the odds of getting a drowning are about one in ten. In other words, you can expect a drowning--based on past experience—every eight to twelve days under those circumstances.

Labor Day weekend presents a special case. On three of the past eight Labor Day weekends, the river has been running over 3.4 feet at some time. Drownings occurred on two of those three holiday weekends. By contrast, no drownings occurred on the other five weekends when the water was running low.

On the average, thirty days each year fall into the "highly dangerous" category. That is 19% of the average number of days between April 1 and Labor Day, and 8% of the total number of days in the year. Those type of days account for 54% of the drownings in the last eight years.

If one also includes the third most dangerous type of day--a sunny weekday in the Spring with the water running 3.4 to 5.2 feet--those three categories together account for 72% of the drownings over the past eight years.

The odds go down sharply for other types of days, from about 1:50 to as low as 1:700.

These statistics are displayed on the next two pages. The first chart shows the odds for different types of days, with odds aggregated where required by the small number of cases. The second chart shows the actual data used to calculate the odds for 24 types of days created by the interaction of season, water level, weather, and day of week.

It is possible that a number of other factors are associated with drownings. Water temperature, for example, appears to be a factor, an association suggested by the large number of drownings in May. Total attendance in the park appears to be associated with drownings, but only mildly, since only half of the drownings (19 out of 39) occur on weekends or holidays. I could not test the statistical significance of water temperature and total attendance because of incomplete data. Other factors in the existing formula probably act as proxies for them.

I did test the relationship between drownings and three additional factors and found no significant associations. The factors are: air temperature that day, daily rainfall (if any), and the weather during the previous week and two weekends.

		April 1 - June 25		June 25 - Labor Day		After Labor Day - March 31	
		Sunny	Cloudy	Sunny	Cloudy	Sunny	Cloudy
Medium Water Level (3.4 - 5.2 ft.)	SSH	7/74	6/74	3/24	1/24	0/121	0/121
	M-F	7/184	0/184	5/59	0/59	1/302	1/302
High or Low Water (Above 5.2 or below 3.4 ft.)	SSH	0/25	1/25	1/47	0/47	0/100	0/100
	M-F	2/61	1/61	2/118	0/118	1/251	0/251

DATA UPON WHICH DROWNING ODDS ARE BASED
NUMBER OF DROWNINGS OVER NUMBER OF
DAYS IN THAT CATEGORY, 1975-82

<table>
<tr><th></th><th></th><th colspan="2">April 1 - June 25</th><th colspan="2">June 25 - Labor Day</th><th colspan="2">After Labor Day - March 31</th></tr>
<tr><th></th><th></th><th>Sunny</th><th>Cloudy</th><th>Sunny</th><th>Cloudy</th><th>Sunny</th><th>Cloudy</th></tr>
<tr><td rowspan="2">Medium Water Level (3.4 - 5.2 ft.)</td><td>SSH</td><td>1:11</td><td>1:12</td><td>1:8</td><td rowspan="2">1:83</td><td rowspan="2" colspan="2">1:423</td></tr>
<tr><td>M-F</td><td>1:26</td><td>NRO</td><td>1:12</td></tr>
<tr><td rowspan="2">High or Low Water (Above 5.2 or below 3.4 ft.)</td><td>SSH</td><td rowspan="2" colspan="2">1:43</td><td rowspan="2">1:55</td><td rowspan="2">NRO</td><td rowspan="2" colspan="2">1:703</td></tr>
<tr><td>M-F</td></tr>
</table>

ODDS OF A DROWNING OCCURING ON ANY GIVEN DAY
BASED ON TIME OF "EAR, WATER LEVEL, WEATHER,
AND D / WEEK

SSH = Sat. Sun. Hol.

(NRO = No recorde ervation:

Profiles and Patterns

A number of patterns in the profiles of persons who have drown in the past eight years suggest the direction that future prevention strategies might take.

Profiles of the persons who drown generally fit the predictions of park rangers. The typical swimmer who drowns is 16 to 19 years old, male. The typical boater who drowns is 22 years old and male. One-third of the drownings occur among hikers, rock hoppers, sunbathers, and fishermen on foot. This group ranges in age from 5 to 74 years old, but most are between 19 and 30 years of age and male. In the last eight years only three females have drown (7½% of the total)--a swimmer, a sunbather, and one rock hopping at the spout of Great Falls.

People in boats tend to drown almost exclusively in the Spring. Swimmers also tend to drown in the Spring, although the Summer still claims a significant number. The most likely drowning victim in the summer is a rock hopper, sunbather, hiker, or fisherman. They are twice as likely to drown in the Summer as in the Spring. Since there are probably more rock hoppers and fishermen and sunbathers in the park to begin with, they are probably in less danger of drowning than swimmers. Nevertheless, they account for most of the Summer drownings.

The propensity of different types of victims to drown in different seasons is shown below.

	April 1 - June 25	June 26 - Labor Day	Rest of Year	
Boaters	9	1	1	11
Swimmers	11	4	0	15
Hikers, Rock Hoppers, Sunbathers, & Fishermen	4	7	2	13
Total	24	12	3	39
Average number of days in period	(86)	(71)	(208)	(365)

TENDENCY OF DIFFERENT TYPES OF VICTIMS
TO DROWN BY SEASON, 1975-1982

A number of the victims had been drinking; some were severely intoxicated. The lack of data overall, however, makes it difficult to assess whether drowning victims are more likely to have been drinking than park visitors at large.

Boaters: An analysis of drownings in terms of the method by which the victims entered the water reveals several significant patterns. Drownings by boat are site specific; that is, they tend to occur in specific areas. Eight of the eleven boaters who drown between 1975 and 1982 were lost between Brookmont Dan and Little Falls. The two still water drownings occurred in canoes rented at Fletchers Boathouse. In spite of (or perhaps because of) the large number of white water boaters in the Mather Gorge--Carderock area, there was not a single fatality involving a boater in that area in the period under study.

The data on boating drownings is summarized below:

4 boaters were lost over Little Falls
4 boaters were lost over Brookmont Dam
1 boater was swept over Great Falls in a raft
2 boaters drown in still water in Fletcher's rentals

Swimmers, Rock Hoppers, Hikers, Sunbathers, and Fishermen on Shore: Swimmers made up 38% of the drownings between 1975 and 1983. Nearly an equal number (33%) were hikers, rock hoppers, sunbathers, and fishermen on shore.

A very specific pattern emerges from an analysis of victims in these two groups. In the early Spring, nearly all of these drownings occur from the Maryland side. In June, the Virginia side drownings begin in force, equaling the Maryland side numbers. After June 25, the Maryland side drownings nearly disappear, and Virginia side drownings dominate. Although it has heavy use, the Maryland side accounts for few summer drownings. Part of this may be due to the heavy patrol of the Maryland side, especially the Catfish Hole area.

The tendency of drownings to shift from the Maryland to Virginia side as the year progresses is displayed on the following table.

	April & May	June 1 - 25	June 25 - Labor Day	
Maryland & D.C.	7	3	2	12
Virginia	1	4	9	14

TENDENCY OF DROWNINGS OF SWIMMERS, HIKERS, ROCK HOPPERS SUNBATHERS & FISHERMEN TO SHIFT FROM THE MARYLAND TO THE VIRGINIA SIDE AS THE SEASON PROGRESSES, 1975 - 1982

The data can be further refined by identifying the specific location of drownings by season. The Spring drownings, dominantly from the Maryland side, occur up and down the river with a slight concentration at the S-Turn/Catfish Hole area. The summer drownings, dominantly from the Virginia side, are concentrated along the main channel of the river from the spout to Difficult Run.

The data are displayed below. Note that the definition of seasons overlaps. The dangerous Spring season for victims entering from the Maryland side lasts through June 25, while the dangerous Summer season for the Virginia side begins June 1.

Entered thru Md./DC	April 1 - June 25	June 26 - Labor Day
Tavern: slackwater above	† †	† †
Tavern: S-Turn/Catfish Hl.	† † † †	
Old Angler's Inn	†	
Carderock	†	
Chain Bridge	† †	

Entered thru Virginia	April 1 - May 31	June 1 - Labor Day
Great Falls NP: Spout		† † † † †
Great Falls NP: S-Turn, Sandy Landing to Difficult Run		† † † †
Brookmont Dam		† † † †
Chain Bridge	†	

LOCATION THROUGH WHICH SWIMMERS, HIKERS, ROCK HOPPERS, SUNBATHERS AND FISHERMEN ENTERED THE AREA AND DROWN, 1975 TO 1982

The Impact of Media Publicity on Drownings: Mike Brown asked me to assess the impact of publicity (eg. newspaper and television reports) on drownings. Although the data remain too incomplete to draw any firm conclusions, there is the suggestion of a relationship.

The years 1978, 1979, and 1980 appear to be low publicity years, based on a survey of Washington Post indexes and park files. The years 1976, 1981, and

1982 appear to have been ones with relatively more publicity.

The low publicity years had relatively few Spring drownings. In part, this may have been a factor in the low level of publicity accorded the dangers of the river in those three years. The high publicity years had relatively more Spring drownings which, along with recent efforts of park officials to secure media coverage, probably encouraged increased media coverage.

The years of low publicity in the Spring were followed by Summers in which ten persons drown. To date, the three high publicity years have produced not a single Summer drowning. The data suggests, although not conclusively, that publicity in the Spring saves lives in the Summer. Although not conclusive, the 10:0 differential cannot be explained away by any of the other factors analyzed in this study.

Recommendations

The data seem to suggest a number of prevention strategies. The most important ones are listed below. I would be glad to discuss more specific steps with you in person.

- Prevention efforts should be increased on those days when the probability of drownings is especially high. This should include:

  Weekends or holidays in the Spring when the water is running between 3.4 and 5.2 feet, with prevention efforts spread out along the course of the river, especially from the Maryland side.

  Sunny days in the Summer when the water is running between 3.4 and 5.2 feet, concentrated along the main channel of the river from Great Falls to Difficult Run, especially from the Virginia side.

  Any Labor Day weekend when the water is running over 3.4 feet should be considered especially dangerous.

  During the overlap period (June 1 to 25), drownings have occurred with equal frequency from both the Maryland and the Virginia days on dangerous days.

- Recognizing that hikers, rock hoppers, sunbathers and fisherman are likely to drown in greater numbers than swimmers during the summer months, develop additional strategies to reduce their tendency to drown.

- Given the propensity of people on the rocks in the vicinity of Great Falls to drown during the summer, I would recommend that no decision be made to reopen the bridge to Falls and Olmstead Island until resources are made available to conduct effective patrols.

- Effective media publicity, earlier in the year and continuous through the Spring should be sought. The media must be convinced not to wait until drownings begin to occur before calling attention to the dangers of the river.

- The timing and concentration of drownings by boat in the Brookmont Dam -- Little Falls area in the Spring suggest that a targeted prevention strategy in that area would have high payoffs. I would recommend a more elaborate system of warning signs at all access points to the river, including the Virginia access to Brookmont Dam, on the river, and at Fletcher's Boathouse, from which area many of the victims begin their journey. Continued cooperation with area boating clubs, eg. Canoe Cruisers, should be pursued to educate the public of the dangers of this section of the Potomac.

- The current work of the River Safety Team, including rescue, patrol, enforcement, and public education, should be continued. The steps outlined above should be considered as supplementary steps to be taken in addition to their current work, which in all probability is reducing drownings that would otherwise occur.

Additional Data and Future Analysis

Records on past drownings are not adequately kept. I had difficulty even determining the number of drownings that occurred in any given year. I would recommend that in the future a separate file be kept on each incident that results in a drowning or drownings, and that a copy of the County Police report be placed in this file as soon as it is available. The county police report, along with the N.P.S. Case Incident report, contains nearly all of the information that a researcher studying the incident would want to know.

Although the current study suggests steps that can be implemented now, additional analysis could reveal more factors that could be taken into account in shaping prevention strategies. Such analysis might include any of the following studies.

- A more detailed analysis of the factors associated with drownings, eg. intoxication, publicity, and the association of drownings with the size of crowds in the parks.

- An evaluation of the work of the River Safety Team to estimate the number of drownings that they annually prevent and assess which of their activities (patrol, rescue, education) have the greatest impact.

- An evaluation of new steps taken to reduce drownings, using indicators to assess the effectiveness of these measures.

RIVER WARNING CHART

Months of April and May

- When are the most dangerous days?

  Any weekend or holiday with the water running between 3.4 and 5.2 feet. Weather does not matter.

- Moderately dangerous days will occur:

  Any weekday with the water running between 3.4 and 5.2 feet when the weather is sunny.

- Where will the victims enter the river?

  Almost exclusively from the Maryland side.

- Who is in the most danger and where are they?

  Boaters on the river -- from Fletchers to Brookmont Dam (expect one drowning)

  Young male swimmers: Above the Tavern
  Old Anglers Inn
  Stubblefield Falls
  Chain Bridge
  Fletcher's
  (expect one drowning)

RIVER WARNING CHART

June 1 to 25

- When are the most dangerous days?

  Any weekend or holiday with the water running between 3.4 and 5.2 feet. Weather does not matter.

- Moderately dangerous days will occur:

  Any weekday with the water running between 3.4 and 5.2 feet when the weather is sunny.

- Where will the victims enter the river?

  Equally from the Maryland and Virginia sides.

- Who is in the most danger and where are they?

  Young male swimmers: Catfish Hole
  Cow Hoof/Sandy Landing
  Brookmont Dam (waders)
  (expect one drowning)

RIVER WARNING CHART

June 25 to Labor Day

- When are the most dangerous days?

  Any sunny day -- weekends especially but weekdays too -- with the water running between 3.4 and 5.2 feet.

- Where will the victims enter the river?

  Primarily from the Virginia side.

- Who is in the most danger and where are they?

  Rock Hoppers and Sunbathers: The Spout
  Above the Tavern
  (expect one drowning)

  Young male swimmers: S-turn
  Difficult Run
  Brookmont Dam (waders)
  (expect one drowning every two years)

* * * *

This information is drawn from *Predicting and Preventing Future Drownings in the Potomac River: A Statistical Analysis*. A Report Prepared for US NPS, C & O NHP, September, 1982, by Dr. Howard E. McCurdy.

All of the predictions on these charts are based upon the assumption that existing patrol activity will continue as it has over the past few years.

A sign should be placed at Fletcher's, on the canal near Chain Bridge, at locks # 5 and #6, at the feeder canal, and on both shores at Brookmont Dam.

The Potomac River

Between Brookmont Dam & Chain Bridge

is more dangerous than

the Youghiogheny.

It kills on the average two persons each year. Do not attempt to run it except with an experienced guide.

Do not under any circumstances go near Brookmont Dam.

Mr. **Fish**. During the months of April and May, we said are the most dangerous days, and any weekend or holiday with the water running between 3.4 and 5.2 feet. That is measured on a gauge down at Little Falls. Weather does not matter. Moderately dangerous days will occur any weekday with the water between 4 and 5 feet. Where the victim will enter the river almost exclusively from the Maryland side, again now, in the months of April and May, who is in the most danger at Brookmont Dam, whether they are boaters from Fletcher, or young male swimmers above the Old Angler's Inn, we expect one drowning.

So in looking at this information over a period of years, we have been able to come up with this, with the help of the professor from American University, and as I mentioned, the position of our people, our recourse is in those areas. As a result of doing that, for the last 2 years we have not had accidents in those particular areas, so we feel that had we not been there, there would have been accidents in those particular areas. So for 2 years this statistical analysis has worked. Obviously, we continue to have drownings but it has helped, though it goes on from June to July and July to Labor Day.

Mr. **Barnes**. Ms. Harrison, how many folks at DNR actually working on this issue—the Potomac River and safety issues?

Ms. **Harrison**. Directly located on the river, we have two personnel. Directly involved in the issue we have more. The kind of things that Sergeant Ritter does in education and public awareness, and just boating safety in general, any time our officers in any area where we are enhancing awareness of your responsibilities. But having the primary responsibility for the water segments itself, we have two people on the water.

Mr. **Barnes**. Are there any plans to beef up those operations?

Ms. **Harrison**. We have considered that and we will pursue that. We are also interested in, I think possibly more efficiency in effectively doing that is working on this concurrent jurisdiction issue with the National Park Service. They have the people in the area, as Mr. Fish mentioned. They are already trained, they often have the kind of equipment that is more amenable to this rafting in rocky situations, than we have in our traditional Boston whaler, as you saw from the excellent film clip. I think that exploring that option next would probably be the most efficient way of going.

Mr. **Barnes**. I see.

Congressman Parris.

Mr. **Parris**. Thank you, Mr. Chairman.

Consistent with our discussion earlier, I wonder if we could hear brief testimony from the National Park Service pilot on the issue? His comments will be pertinent to the issue here—to this panel—which of course is water safety.

Mr. **Barnes**. We welcome any comments from Mr. Cronin.

Mr. **Fish**. We appreciate our earlier comment, Mr. Parris, about Officer Cronin.

Mr. **Cronin**. I am Earl Cronin. Mr. Chairman and members of the committee, thank you.

As Congressman Wolf has commented in his testimony, he mentioned the safety aspect of the operations on the river. That is one of our main concerns, the drawback in safety in general and in particular aircraft operation during river rescue. Should the aircraft experience failure during a river rescue, the aircraft and crew would probably be lost. With the current aircraft, in order to maintain safety margin in lifting, lift capability is limited to a maximum of two and in certain accidents, one person.

Mr. Parris. Let me, if I might, pursue that just very quickly, Mr. Chairman.

If I understand what you are telling me, Mr. Cronin, if there was a situation of panic similar to the one we saw in this clip and there were five people in the water, you came over in the existing equipment that you have with the net that you have, you dropped it in the water and four people got hold of it, and obviously none would want to let go, are you telling us that would probably result in the chopper going in the water rather than the people coming out?

Mr. Cronin. There is a possibility of that, sir. It is more likely we would have very, very much difficulty in even pulling the people to shore.

Mr. Parris. Because it exceeds the capability of the equipment, is that it?

Mr. Cronin. Yes, sir.

Mr. Parris. What can we do to improve the safety and effectiveness of the helicopter rescue that you now undertake?

Mr. Cronin. One of the things that would improve the safety of the crew and people being rescued would be utilization of twin engine aircraft. In fact, the aircraft that you saw in that footage 2 weeks later experienced an engine failure and luckily it was able to land without injury to the crew.

Mr. Parris. And the twin engine capacity would be, the lifting capacity would be increased by additional power?

Mr. Cronin. That would also allow us to have the safety of a second engine and also hopefully allow us to lift more people.

Mr. Parris. As I understand it, there is currently being considered in your budgetary process the question of the supplying of that kind of equipment to this unit, is that correct?

Mr. Fish. I am not sure that it is, Mr. Parris. I don't believe that has been a specific issue with the Appropriations Committee.

Mr. Parris. I certainly don't mean to suggest the operation of your department, but certainly it seems to have considerable merit to me and I was in that—I have flown behind single engine airplanes for 30 years. I was in a helicopter on the river the other day and the thought occurred to me what happens if this thing coughs and I think what Mr. Cronin said here, it just seems to me, Jack, that if the availability of that equipment and size and function—I know the administrative cost of operation is a consideration—but we are going to have a case where there is going to be more than one person looking to grab that net one of these days.

Mr. Fish. Actually, we have looked into cooperation with the Army or someone that may have some bigger helicopters down at Fort Belvoir. But I think Officer Cronin could comment better than I. You get a helicopter too big and you cause problems down in the water because of the draft from the blade, but the unit that he was talking about, the two engine wouldn't produce that type of problem. We would be glad to look into that and see what we can come up with, because there are no other units like that right in the immediate area.

Mr. PARRIS. It certainly would seem to me to have considerable merit.

Mr. FISH. I agree with you.

Mr. PARRIS. I would share your comment in your testimony that helicopters are not a panacea, the answer is education and other combined efforts of one kind or another. But let me ask you quickly, Mr. Fish, as has been indicated in that videotape, the use of zodiac or Boston whalers are precluded—I am talking now of the section of the river that we are all familiar with, that section below Great Falls up through that area—much of that river as you so well know is totally inaccessible for any purpose, for emergency ground crews, et cetera. It just seems to me that because of the geography, that helicopter is the best way to accomplish rescue, and surveillance, and patrolling, and all the rest. Do you agree with that?

Mr. FISH. In certain areas it is the only way, it really is.

Mr. PARRIS. Let me just very quickly, Colonel Walsh, on a perhaps less dramatic but important issue, flood control. Do I understand from your testimony, what I have read in terms of this graphic—I think it was the figure 4 attached to the statement—that without the closures, without the completion of the flood control measures that you alluded to here, that we have a flood, potential flood area, which extends to the base of Capitol Hill—just below this building—and does in fact include essentially the front yard of the White House. Is that possible?

Colonel WALSH. You are right on the money, Congressman. The 1936–42 flood, which occurred after the construction of the local protection works, had the emergency and temporary construction not been put in place in a timely manner, this area in blue would have been flooded.

The 1942 flood though is some 6 feet lower than the flood that we designed for, so that the permanent portions of the local flood protection work are designed some 6 feet higher and in keeping with our research and statement of requirement. For the NSP, who is the executing agent in putting that emergency structure in place, they certainly were responsive in 1942 when they put this into place. But the type of flood that could develop could well be some 6 feet higher than the one that they successfully encountered in 1942 and there could be very easily circumstances which would have made the efforts that were previously successful not successful because of that.

Again, later in 1946, Congress did authorize that project, but since that time the dollars have not been forthcoming.

Mr. PARRIS. That project that you talk about in your testimony, that potential would be minimized, is that correct?

Colonel WALSH. What we would think would be prudent to look at would be converting those potential temporary structures, one down at this end and one up at this end, by converting them into permanent structures—again they would have to be done very well—but that kind of structure is already existing on the north side of the reflecting pool. That would successfully counter that extent of the flood; yes, sir.

Mr. PARRIS. The only good thing I can see here, Colonel, in the area of good news, of the 19 Government agencies that you list that would be flooded in the event of that situation, the IRS is among them.

Will the bags that you talk about in your testimony, Colonel, at the dam, eliminate that vertical roller?

Colonel WALSH. Yes, sir; it will eliminate the vertical roller. This has been—first of all, we have designed that method at the Baltimore district. We have also supplied that down in the water waste experiment station, which is a laboratory that excels in this kind of work within the Corps of Engineers, and they have very specific models, several aspects of construction, types of construction alternatives with various flows simulated in their models, and the one that we are planning on constructing does eliminate the roller.

There will naturally be people who will try to make the run and this will not necessarily preclude drownings, but it will certainly eliminate them from the standpoint of the vertical roller.

There was one other aspect. As flows increased not only you had initially the vertical roller, as the flows increased you had a type of current which was exactly the vertical roller. Both of those should be eliminated by this type of construction and water carried in sheet flow.

Mr. PARRIS. That will be covered under previously authorized and appropriated funds?

Colonel WALSH. Yes, sir.

Mr. PARRIS. And will be completed, based I think you said in December of this year?

Colonel WALSH. We plan to start in August and finish in December.

Mr. PARRIS. Very quickly, Mr. Chairman, I thank you for your indulgence. One question, the buoys on the dam just above this, I am told that the ice essentially takes those buoys out every year. Do you have any thought to suspend those things across the river, not only on a cable. Would that make sense? You know, the big white buoys I am talking about?

Colonel WALSH. Yes, sir; first, this latest set of buoys is considerably larger than any we have had there before.

Mr. PARRIS. Have they been tested in ice conditions?

Colonel WALSH. No, they have not.

Mr. PARRIS. Let me just very quickly, Mr. Chairman.

In your testimony, Colonel, you talk about hydrilla. In 1982, in that graphic, there were 10 acres of hydrilla at dike at Marsh Basin. Now in 1984, your testimony indicates that there are 600 acres of hydrilla from the reflecting pool to Fredericksburg. That is an increase of 60 times in 2 years. That thing is working like compound interest, as I understand it, it multiplies by the square. Have we in fact lost the control of hydrilla in the Potomac River?

Colonel WALSH. Hydrilla, sir, is not necessarily a plant we have absolutely controlled. Once it arrives on the scene, we'd have to live with it. I will be providing additional testimony in the second phase of this.

Mr. PARRIS. We will save that question until then. You might think about it a little bit.

Colonel WALSH. Yes, sir.

Mr. **Barnes**. I want to thank all of your witnesses for appearing this afternoon. Your testimony is very, very much appreciated and very helpful, and I hope we will move forward on some of the things we have discussed this afternoon.

Thank you very much.

We will take a 2-minute recess and then we will begin with the next panel.

[A short recess was taken.]

Mr. **Barnes**. Let me ask our next panel of witnesses to come up.

Mr. James Seif, Regional Administrator, region III, Environmental Protection Agency; Col. Martin Walsh, U.S. Army Corps of Engineers; Wallace White, chairman, Water Resources Planning Board, Metropolitan Washington Council of Governments; and Noman M. Cole, Jr., MPR Associates.

Before we hear from our witnesses, I want to welcome my colleague from the District of Columbia, Mr. Fauntroy. I know that Mr. Fauntroy wanted to be with us throughout the entire hearing, but unfortunately had to attend a funeral this afternoon.

We very much appreciate your being here now, Walter, and welcome any comments that you might have.

Mr. **Fauntroy**. Thank you, Mr. Chairman.

I first want to commend you for your leadership in convening these hearings. I want to make a unanimous consent request that my remarks appear following yours in the opening of the hearing because I wanted to thank you for your mention of the Billy Pugh net, and it is appropriate that it would be brought up at a time when the region is being praised for accomplishment resulting from cooperativeness among all of us.

As you stated, following the hearings on the Air Florida crash, the Committee on the District of Columbia learned of a rescue net invented to retrieve the early astronauts from the ocean. We arranged for an experienced helicopter pilot to come to the District of Columbia to give a demonstration.

The National Capital Park Police made the helicopter available.

The District of Columbia Police Department volunteered two of its frogmen to be rescued.

The Federal Aviation Administration and National Airport provided facilities along the Potomac River to demonstrate a water rescue for fire and police chiefs from all over the Washington area.

Following the demonstration, the FAA agreed to purchase nets for use at National Airport.

Apparently, the District of Columbia Police Department and the National Capital Park Service also thought the nets were a good idea.

So while I am proud of the D.C. Committee staff for its initiative and perseverance in putting together the demonstration that has led to saving several lives on the Potomac River, it could not have happened without the cooperation of many other local agencies.

I would also like to compliment you, Mr. Chairman, for continuing the committee's oversight role on the Potomac River and offer my full cooperation in any way possible in addressing the issues of today's hearing.

Mr. **Barnes**. Well, thank you very much, Mr. Fauntroy, and you weren't here to hear me, you obviously had an opportunity to read what I said or had to say earlier in commending your role in the past years, and I look forward to continuing to work with you on it.

Now we will turn to our next panel. I think we will go down the list as provided in the notice of the hearing.

First, we will hear from Mr. James Seif, the Regional Administrator of EPA.

STATEMENTS OF JAMES SEIF, REGIONAL ADMINISTRATOR, ENVIRONMENTAL PROTECTION AGENCY; COL. MARTIN WALSH, JR., U.S. ARMY CORPS OF ENGINEERS; WALLACE WHITE, CHAIRMAN, WATER RESOURCES PLANNING BOARD; AND NOMAN M. COLE, JR., MPR ASSOCIATES

STATEMENT OF JAMES SEIF

Mr. Seif. Good afternoon, Mr. Chairman, and members of the subcommittee. I am James M. Seif, Regional Administrator for the Middle Atlantic States of the Environmental Protection Agency. My responsibility is to implement—along with my State colleagues in the District of Columbia, Maryland, Virginia, Pennsylvania, West Virginia, and Delaware—the many Federal environmental programs administered by the EPA. These include the programs carried out under the Clean Water Act to improve the quality of the Potomac River, its tributaries and, ultimately, the Chesapeake Bay.

Accompanying me today is Mr. Lanny Teller, and Mr. Charles App, an environmental engineer on our water division staff in PHL. Mr. App has devoted many years to studying the Potomac River and to assisting EPA and State agencies in translating water quality data into effective pollution abatement decisions.

I am pleased to follow two of my predecessors who testified before this subcommittee in 1976 and 1979 to discuss trends in the quality of the Potomac River. As you requested, Mr. Chairman, I am here to discuss trends in point source, nonpoint source, and combined sewer overflow loadings to the river, as well as to assess performance of the Blue Plains wastewater treatment plant. I hope, too, to relate improvements in the Potomac Basin to the quality of the Chesapeake Bay.

I am pleased to report that, since passage of the Clean Water Act in 1972, very substantial progress has been made in reducing the three historically persistent Potomac River problems of low dissolved oxygen, high bacterial concentrations, and excessive algae growth. I know that Mayor Barry and thousands of residents are looking forward to this year's riverfest on June 8 to celebrate these improvements and to demonstrate the importance of a cleaner river to all of us.

We all learned as well that constant work on abatement programs is required to maintain the decade of progress.

In order to place my statement in proper context, it would be useful to define the three primary sources of pollution affecting the Potomac River: Point sources, nonpoint sources, and combined sewer overflows.

First, point sources discharge treated wastewater from sewage treatment plants. In the D.C. metro area, there are nine major municipal dischargers. Blue Plains provides 70 percent of municipal flows, and there are no significant industrial point sources.

Second, nonpoint sources from streets and fields, are diffuse sources of pollution and that includes water runoff and provide a number of pollutants which reach the Potomac River and the Chesapeake Bay.

Third, combined sewer overflows, which are common in many older cities, including the District, are the source of diluted raw sewage from sewer systems when flows exceed capacity. These overflows occur during heavy rains and present a special difficulty in reducing pollutant loadings to the Potomac River in this area.

Within the context of these pollutant sources, I would like to turn to a discussion of trends in dissolved oxygen, bacteria, and excessive algae growth. These are three of the most important indicators of river health, around which pollution control and monitoring programs are designed.

Dissolved oxygen is required to support aquatic life. Dissolved oxygen levels in the Potomac estuary are primarily a function of point source oxygen demands, measured in terms known as BOD5 and TKN, or, spelled out, biochemical oxygen demand and total Kjeldahl nitrogen.

Exhibit 1, which is attached to this statement, shows the point source loading trend since 1968–70 as well as the response of dissolved oxygen levels in the Potomac estuary to reductions in waste loadings. It can be seen that during 1968–70, dissolved oxygen levels as low as 1 milligram per liter were common, with summer averages consistently below the standard of 5 mg/l. Such low levels produce fish kills. By 1977, as a direct result of upgraded treatment at Blue Plains and other plants, reductions of 45 percent in BOD5 from point sources increased dissolved oxygen levels in the river.

I would point out that the occasional low dissolved oxygen levels in August 1983, were primarily due to sediment oxygen demand and combined sewer overflows. EPA believes the implementation of the District's combined sewer overflow control progam, which is supported by EPA's 1984 construction grant, and other ongoing abatement programs will lead to consistent achievement of dissolved oxygen standards in the Potomac.

Levels of fecal coliform bacteria are an indicator of animal waste contamination, and the potential for pathogens at levels too high for healthful human contact. This problem has been significantly reduced, as exhibit 2 shows, but despite this high degree of control at the major point sources, fecal coliform standards are occasionally exceeded in the Potomac River, primarily during wet weather. This condition shows the importance of bacterial contributions from nonpoint sources and combined sewer overflows. The combined sewer overflow control program will improve the bacterial quality of the river.

I would also convey to the subcommittee that the EPA Office of Water is currently reevaluating the national criterion used to indicate the acceptability of a stream for contact recreation. If the criterion is revised to something other than fecal coliform, the status of the Potomac River with respect to this use for contact recreation, must also be reassessed.

Efforts have been underway since the late 1960's to reduce the excessive growth of algae in the Potomac estuary. These efforts at Blue Plains and other treatment plants have centered on reducing point source loadings of phosphorus, which is one of the nutrients necessary for algal growth.

As shown in exhibit 3, a comparison of chlorophyll levels, which are a measure of algal growth, between 1968 and 1977, two periods of similar riverflow—indicates that although the average concentration was very nearly equal, the peak values declined by 1977.

Further, the years 1978 through 1981 had substantially lower chlorophyll levels. This should not be surprising because riverflows were higher during this period and point source phosphorus loadings continued to decline. Additional reductions in point source phosphorus loadings were achieved between 1981 and 1983, producing a cumulative reduction of 90 percent since 1968.

In summary, the Potomac's algae problem declined substantially between 1968 and the early 1980's, but the 1983 algae bloom, unfortunately and unexpectedly a severe bloom of blue-green called microsystis aruga nosa, occurred in 1983. Because the reason for this reversal was not readily explainable, and in view of the complexity of the Potomac estuary, EPA and the three States convened a panel of experts to investigate the causes of the bloom. The study was published in March of this year.

The panel concluded that the onset of the bloom, to levels of 100 micrograms per liter at the end of July, was caused by a combination of favorable climatic and hydrologic conditions—that means high temperature, calm wind, much sunshine and lower than average riverflows, and adequate nutrients. The Potomac eutrophication model is a sophisticated simulation technique used to assess the impact of various river conditions. The model has simulated this phase of the bloom, but not the latter stages in August through October when it intensified to levels of 250–300 μg/l of chlorophyll.

The panel concluded that this was caused and maintained by a substantial source of phosphorus released from the river sediments themselves, as a result of the high pH of the water. The elevated pH levels appear to have been caused by the low buffering capacity of the estuary during 1983. This phenomenon was not predictable from historical data or the Potomac eutrophication model.

The panel recommended that, to reduce the frequency of occurrences of algal blooms, in addition to ongoing point source phosphorus was recommended, as well as continuation of the existing monitoring program.

Looking at long-term trends in the Potomac estuary, EPA believes that substantial progress has been made to control eutrophication. There remain unanswered questions which will be addressed in the years to come.

Our interest in the 1983 algae bloom and related water quality issues did not end with the March 1985 report. I want to assure the subcommittee that EPA and the States, supported by the Council of Governments, are already acting on the panel's conclusions and recommendations and taking steps toward implementation of an appropriate control program, should one be necessary. Exhibit 4 illustrates the process which is underway and a schedule of milestones. We would be pleased to provide additional information about this process.

I do want to point out that the Monocacy basin has been designated by Maryland as a priority watershed for control of nonpoint, agricultural nutrients. This designation carries with it the availability of existing best mangement practice cost-sharing from the State and the Chesapeake Bay program. It is a good example of a progressive State approach.

Improvement of the quality of the Potomac River is important not only to the river and the residents of the metropolitan area, but to the Chesapeake Bay as a whole. After 7 years of scientific and management studies, a historic agreement was reached in December 1983, among EPA and the four bay States. We have entered an implementation phase whose initial milestone is scheduled to take place this July when a multiyear plan will be considered for adoption by the Chesapeake Bay Executive Council. To put control programs in perspective, I want to assure the subcommittee that programs underway and expected to be implemented to protect the Potomac River will take into account the need to protect the bay.

I also want to assure the subcommittee of the continuing support of the bay program by the President, EPA, and all Federal agencies whose activities affect the bay.

In the last year, two other Potomac River water quality issues have received consideration attention—hydrilla and dioxin.

Hydrilla, which is a submerged aquatic plant, was inadvertently transplanted into a tributary of the Potomac River in 1982. It has since spread to occupy over 400 acres of shoreline in the tidal freshwater zone in and around the District. Three is a lack of agreement among scientists about the potential impact of the plant. For example, despite some negative effects, many biologists believe that hydrilla performs many of the functions in the Potomac River ecosystem as native submerged vegetation. These include shoreline stabilization, nutrient uptake and production of useful organic deritus, sediment deposition, water clarification and provision of shelter and food for organisms. Because hydrilla grows densest in locations that had been devoid of aquatic vegetation, it may in fact be beneficial to the Potomac River ecosystem.

The Hydrilla Regional Action Committee, under the direction of the Interstate Commission on the Potomac River Basin, was formed to coordinate the activities of many local, State, and Federal agencies. EPA was represented on the committee by our Chesapeake Bay program. We understand that the HYDRAC Committee has been replaced by a coordination committee chaired by the corps. EPA continues to be represented on this committee.

Although there have been several proposals to use herbicides to control hydrilla, and EPA has supported a limited, carefully monitored testing of diquat, the States of Maryland and Virginia opposed this approach and EPA has not approved full scale herbicide application. We understand that there are no plans to use herbicides at this time. The situation is being closely monitored by the agencies, and proper coordination will take place before any control approach is adopted.

As part of EPA's, national study on dioxin, samples were recently taken at and near the Alexandria site of the former R.H. Bogle plant. The plant was operated in the twenties through the mid-seventies, and dioxin-contaminated herbicides may have been handled, blended, or formulated there. The Bogle site is one of approximately 80 sites in the Nation within this category.

The results of our sampling show that dioxin was not detectable in soil near the former plant. Dioxin concentrations in several Potomac River sediment samples ranged from less than 1 part per trillion to 232 parts per trillion. While there are no standards or guidelines for evaluating dioxin in sediments, we will use the results of the sampling to evaluate any dredging projects for this potential impact on the bioavailability of dioxin in the estuary. Analyses also showed that fish collected near the site contained 6.3 parts per trillion, or less, which is considerably lower than an action level of 25 parts per trillion identified by the Food and Drug Administration for fish in the Great Lakes.

It has been recognized for many years that Potomac River water quality can be improved only if EPA, the States, and many local jurisdictions cooperate in both collecting, analyzing and interpreting water quality data, on the one hand, while planning for and deciding on basic control decisions. What became known as the Potomac strategy was created in April 1979, to improve coordination of the various water quality programs being undertaken by all levels of government in the D.C. metro area. The chief administrative officers of the several local jurisdictions, ably chaired by Fairfax County Executive J. Hamilton Lambert, regularly meet to coordinate local views and activities.

Water quality data collection and technical modeling studies form the core of the Potomac strategy, which is managed by EPA, the District, Maryland, and Virginia, with active participation by the Council of Governments and Interstate Commission of the Potomac River Basin. Indeed, the expert panel appointed to study the 1983 algae bloom did its work within the management framework of the Potomac strategy. Exhibit 5 illustrates the Potomac strategy.

EPA has continuously advocated and supported the fundamental importance of intergovernmental cooperation in the Clean Water Act's planning and construction grant program as well. The most recent example of Federal and local recognition of this metropolitan approach is a memorandum of understanding signed in September 1984 to lead to an interjurisdictional agreement on the allocation of capacity and financial responsibility for operation of Blue Plains. EPA will continue to insist that the pledge by the chief administrative officers be honored to promptly reach a long-term agreement. I believe that all parties are acting vigorously to achieve an agreement, and that one will be completed in the very near future. Let me emphasize that an agreement is not an end in itself, but will provide the framework for resolving the most important water quality management issues in the area.

A word now about Blue Plains treatment plant. It is not surprising that discussions of regional environmental cooperation often center on the Blue Plains treatment plant. While the facility is owned and operated by the District, it also serves parts of Montgomery and Prince Georges Counties in Maryland, and Fairfax County, VA.

Blue Plains is, by any standard, a very large and complex treatment works. Indeed, with a capacity of 309 million gallons per day, peak flows at the rate of 650 million gallons per day, and one of the Nation's most stringent effluent discharge permits, operating and maintaining Blue Plains is one of the District's most challenging jobs.

Performance at Blue Plains has improved very significantly in recent years, and is continuing to improve under the direction of Wally White. It now regularly meets its advanced waste treatment requirements for BOD, total suspended solids, and phosphorus.

Recognizing that the plant maintenance is a key factor in both improving performance and increasing the life of the facility, EPA's National Enforcement Investigation Center studied Blue Plains in 1984 and concluded that inadequate preventive and remedial maintenance increased the difficulty of routinely meeting effluent limits as well as greatly reducing the longevity of major plant equipment. I would add that EPA's motivation to assist the District in identifying operating difficulties was twofold: To protect the Potomac River and Chesapeake Bay, as well as to preserve a Federal investment of $310 million.

An unambiguous indicator of the level of maintenance at any treatment plant is the number of maintenance workers employed, and Potomac River was employing only a fraction of the workers needed—88 maintenance workers were employed, as compared to an estimated need for more than 300. This inadequate manpower showed itself clearly in the condition of major and minor equipment.

EPA responded to this situation by negotiating a consent decree with the District. Lodged in September 1984, and entered in January 1985, the consent decree contains specific maintenance requirements in terms of manpower and equipment repair. The consent decree also specified compliance with all effluent limits and pretreatment requirements.

I am pleased to be able to report to the subcommittee that the District, with minor exceptions, is in substantial compliance with the terms of the consent decree.

In summary on Blue Plains, EPA and the District recognized the importance of significantly improving the operation and maintenance of Blue Plains, negotiated a very specific consent decree to implement those improvements and the District is in substantial compliance with all significant requirements. Monthly status reports allow EPA to closely monitor the District's performance. Given the stringency of the decree and the precedent setting level of effort required for compliance, EPA is pleased with the District's performance.

Mr. Chairman, you may also recall hearing about a delightful luncheon hosted by Mayor Barry last spring at Blue Plains, celebrating the 5-year agreement and removal of the long growing sludge pile. Further, a 20-year sludge program has been largely identified and will be embodied in a new intermunicipal agreement which I referred to a few minutes ago. Thus, we have come a long way in the last year and we have reason to be optimistic that a long-term sludge program for Blue Plains will soon be in place.

Mr. Chairman, I believe that the improvement which has taken place in the Potomac River is a success story that demonstrates what can be accomplished when intergovernmental cooperation and long-range planning are sustained for many years. We thank the subcommittee, on behalf of all users, for its longstanding interest in the quality of the Potomac River and its numerous intergovernmental and technical aspects. I hope that my testimony and that of my colleagues today is helpful to the subcommittee in understanding both trends in the condition of the river, as well as recent and current activities aimed at continuing the job of improving it. After $1 billion investment by the Federal and local governments, we should never lose our dedication to the Potomac River and the Chesapeake Bay into which it flows.

I would be pleased at this time to respond to any questions of interest to the subcommittee.

Turning to exhibit 2, depicting fecal coliform bacteria, levels of this bacteria are an indicator of animal waste contamination and the potential for pathogens at levels too high for healthful human contact. This problem has been significantly reduced, as exhibit 2 shows, but despite this high degree of control, at the major point sources, fecal coliform standards are occasionally exceeded on the Potomac primarily during weather.

This condition shows the importance of bacterial contributions from nonpoint sources and combined sewer overflows. The combined sewer overflow control program will improve the bacterial quality of the river. I would also convey to the subcommittee that the EPA Office of Water is currently reevaluating the national criterion used to indicate what is an acceptable level in a stream for contact recreation. If the criterian is revised to something other than fecal coliform, the status of the Potomac with respect to its use for contact recreation will have to be reassessed.

Mr. BARNES. Excuse me, Mr. Seif. I don't want to interrupt. I am just hoping you can summarize a little bit. Obviously, you have got very extensive testimony, and we will include it all in the record if you can summarize as much as possible.

Mr. SEIF. I appreciate that. Let me turn, if I may, under those circumstances, to the 1983 algae bloom. It was, as everyone here knows, a tremendous surprise. It was unfortunate and unexpected, and it appeared to be a reversal of water quality trend, but in many respects, it may have been a blessing in disguise. Let me explain that.

In March of this year, EPA published its study of what had happened during that particular period of time. There were a series of events both climatic and hydrologic, meaning high temperatures, calm winds, a lot of sunshine, and low riverflow combined with nutrients, and this produced a predicted level of algae bloom early on during that period, but apparently, and by surprise, a lot of extra nutrients came off the river sediments. These were triggered by extra acid in the water, and from that, of course, we have learned a considerable amount, and we can predict that this was, although a very rare event, possibly one which we will see again.

I want to point out that we could well see that again, even as soon as this summer, with the same kinds of conditions prevailing, low waterflow is the one that we can now predict, and if weather conditions and hydrologic conditions repeat themselves, we may have the same problem again.

We want to attack that problem in much the same way we have, namely, continued pressure on controls for point sources, work with nonpoint sources, and EPA and District work on the combined sewage overflow projects. We will do our best to further these projects, in the hopes that in future years, even if there is a problem again this summer, that problem will be considerably reduced as time goes on.

I think if the chairman is able to take the entire testimony as rendered, with remarks on the Chesapeake Bay, which I think are of great importance especially to this administration, and the remarks that I would like to emphasize about the work done at Blue Plains, which we think has shown tremendous progress under Wally White and Mayor Barry in the last few years, I would be happy to conclude at the moment again with thanks to the subcommittee for hearing EPA's remarks on these matters.

Mr. **Barnes**. Thank you very much for your testimony, Mr. Seif. It is excellent and we have had the opportunity to review it briefly and we will include the entire testimony in the record.

I was pleased to hear your statement of the importance of the Chesapeake Bay to the administration, because those of us from this region are, as you suggested, extremely interested in the bay, and the impact that the river and other parts of the region are going to have on the bay. We salute EPA for your commitment to helping keep the bay the great natural resource that it is for our region.

[The prepared statement with attachments of Mr. Seif follow:]

STATEMENT OF

JAMES M. SEIF

REGIONAL ADMINISTRATOR

U.S. ENVIRONMENTAL PROTECTION AGENCY

BEFORE THE

SUBCOMMITTEE ON GOVERNMENT OPERATIONS & METROPOLITAN AFFAIRS

COMMITTEE ON THE DISTRICT OF COLUMBIA

HOUSE OF REPRESENTATIVES

MAY 29, 1985

Good afternoon, Mr. Chairman and members of the Subcommittee. I am James M. Seif, Regional Administrator for the Middle Atlantic States of the Environmental Protection Agency. My responsibility is to implement, with my State colleagues in the District of Columbia, Maryland, Virginia, Pennsylvania, West Virginia and Delaware, the many Federal environmental programs administered by EPA. These include the important programs carried out under the Clean Water Act to improve the quality of the Potomac River, its tributaries and, ultimately, the Chesapeake Bay. Accompanying me today is Charles Ann, a member of our Water Division staff who has devoted many years to studying the Potomac and to assisting EPA and State agencies in translating water quality data into effective pollution abatement decisions.

I am pleased to follow two of my predecessors who testified before this Subcommittee in 1976 and 1979 to discuss trends in the quality of the Potomac. As you requested, Mr. Chairman, I am here to discuss trends in point source, non-point source and combined sewer overflow loadings to the river, as well as to assess performance of the Blue Plains wastewater treatment plant. I hope, too, to emphasize the fundamental importance of interjurisdictional cooperation in the continuing effort to improve the Potomac, and to relate improvements in the Potomac basin to the quality of the Chesapeake Bay.

Water Quality Trends in the Potomac River

I am pleased to report that, since passage of the Clean Water Act in 1972, very substantial progress has been made in reducing the three historically persistent Potomac River problems of low dissolved oxygen, high bacterial concentrations, and excessive algae growth. These improvements are gratifying to EPA and our State and local partners. I know that Mayor Barry and thousands of residents are looking forward to this year's Riverfest, to celebrate these improvements and to demonstrate the importance of a cleaner river to our quality of life. We all have learned as well that constant planning and implementation of abatement programs are required to maintain the progress that has been achieved after more than a decade of hard work and heavy investments.

In order to place my statement in proper context, it would be useful to define the three primary sources of pollution affecting the Potomac: point sources, non-point sources and combined sewer overflows. Point sources discharge treated wastewater from sewage treatment plants. In the DC Metro area, there are nine major municipal dischargers; Blue Plains provides 70 percent of municipal flows, and there are no significant industrial point sources. Non-point sources from streets and fields are diffuse sources of pollution that includes water runoff and provide a number of pollutants which reach the Potomac and the Chesapeake Bay. Combined sewer overflows, which are common in many older cities including the District, are the source of diluted raw sewage from sewer systems when flows exceed capacity. These overflows occur during heavy rains, and present a special difficulty in reducing pollutant loadings to the Potomac in the DC Metro area.

Within the context of these three pollutant sources, I would like to turn to a discussion of trends in dissolved oxygen, bacteria and excessive algae growth. These are three of the most important indicators of river health, around which pollution control and monitoring programs are designed.

Dissolved Oxygen

Dissolved oxygen (DO) is required to support aquatic life. DO levels in the Potomac estuary are primarily a function of point source oxygen demands, measured in terms known as BOD5 and TKN (or, spelled out, biochemical oxygen demand and total Kjeldahl nitrogen). A healthy stream is likely to have a DO level of 5 mg/l. Exhibit 1, which is attached to this statement, shows the point source loading trend since 1968-1970 as well as the response of DO levels in the Potomac estuary to reductions in waste loadings. It can be seen that during 1968-1970, DO levels as low as 1 milligram per liter (1 mg/l) were common, with summer averages consistently below the standard of 5 mg/l. Such low levels produce fish kills. By 1977, as a direct result of upgraded treatment at Blue Plains and other plants, reductions of 45 percent in BOD5 from point sources increased DO levels in the river. Thus, it can be seen that at summer flows similar to 1968-1970, DO levels by summer 1977 averaged between 4 and 5 mg/l, with minimums of 2 mg/l. Between 1977 and 1983, with a further reduction of

77 percent in point source loadings of BOD5, while TKN was being reduced by 70 percent, DO levels again rose significantly. Although the 5 mg/l summer standard was periodically violated in August 1983, the summer average was more than 6 mg/l. I would point out that the occasional low DO levels in August 1983 were primarily due to sediment oxygen demand and combined sewer overflows. EPA believes that implementation of the District's combined sewer overflow control program, which is supported by EPA's 1984 construction grant, and other ongoing abatement programs will lead to consistent achievement of DO standards in the Potomac.

Fecal Coliform Bacteria

Levels of fecal coliform bacteria are an indicator of animal waste contamination, and the potential for pathogens at levels too high for healthful human contact. Just as improved treatment at the Metro area's treatment plants significantly reduced BOD5 and TKN during the past fifteen years, adequate disinfection at these point sources was also achieved. This has significantly reduced, as Exhibit 7 shows, the levels of fecal coliform in the Potomac. During 1983 the treated effluent from the nine major municipal plants in the upper estuary met their permit requirements (which are identical to the in-stream standard) for fecal coliform. Despite this high degree of control at the major point sources, fecal coliform standards are occasionaly exceeded in the Potomac, primarily during wet weather. This condition shows the importance of bacterial contributions from nonpoint sources and combined sewer overflows. The combined sewer overflow control program will improve the bacterial quality of the river. I would also convey to the Subcommittee that the EPA Office of Water is currently reevaluating the national criterion used to indicate the acceptability of a stream for contact recreation. If the criterion is revised to something other than fecal coliform, the status of the Potomac with respect to its use for contact recreation must also be reassessed.

Excessive Growth of Algae

Efforts have been underway since the late 1960s to reduce the excessive growth of algae in the Potomac estuary. These efforts at Blue Plains and other treatment plants have centered on reducing point source loadings of phosphorus, which is one of the nutrients necessary for algal growth. Exhibit 3 shows the decline of point source phosphorus loading from about 35,000 pounds per day (lbs/day) in 1968-1970, to 7,400 lbs/day in 1977, to 4,300 lbs/day in 1981. This significant decline has yielded some success in controlling algal growth. As shown in Exhibit 3, a comparison of chlorophyll levels, which are a measure of algal growth, between 1968-1970 and 1977 - two periods of similar river flow - indicates that although the average concentration was very nearly equal, the peak values declined by 1977. Further, the years 1978 through 1981 had substantially lower chlorophyll levels. This should not be surprising because river flows were higher during this period and point source phosphorus loadings continued to decline. Additional reductions in point source phosphorus loadings were achieved between 1981 and 1983, producing a cumulative reduction of 90 percent since 1968-1970.

In summary, the Potomac's algae problem declined substantially between 1968 and the early 1980's.

1983 Algae Bloom

Unfortunately and unexpectedly, a severe bloom of blue-green algae occurred in 1983. Because the reason for this reversal was not readily explainable, and in view of the complexity of the Potomac estuary, EPA and the three States convened a panel of experts to investigate the causes of the bloom. The study was published in March of this year.

The panel concluded that the onset of the bloom, to levels of 100 micrograms per liter (ug/l) at the end of July, was caused by a combination of favorable climatic and hydrologic conditions - high temperature, calm wind, much sunshine and lower than average river flows - and adequate nutrients. The Potomac Eutrophication Model is a sophisticated simulation technique used to assess the impact of various river conditions. The model has simulated this phase of the bloom, but not the latter stages in August through October when it intensified to levels of 250 - 300 ug/l of chlorophyll. The panel concluded that this was caused and maintained by a substantial source of phosphorus released from river sediments, as a result of the high pH of the water. The elevated pH levels appear to have been caused by the low buffering capacity of the estuary during 1983. This phenomenon was not predictable from historical data or the Potomac Eutrophication Model.

The panel recommended that, to reduce the likelihood of occurrences of algal blooms, in addition to ongoing point source phosphorus removal program, consideration should be given to other control strategies. Further study of the release of sediment phosphorus was recommended, as was continuation of the existing monitoring program.

Looking at long term trends in the Potomac estuary, EPA believes that substantial progress has been made to control eutrophication. There remain unanswered questions which will be addressed in the years to come.

Ongoing and Future Activities

Our interest in the 1983 algae bloom and related water quality issues did not end with the March 1985 report. I want to assure the Subcommittee that EPA and the States, supported by the Council of Governments, are already acting on the panel's conclusions and recommendations and taking steps toward implementation of an appropriate control program, should one be necessary. Exhibit 4 illustrates the process which is underway and a schedule of milestones. We would be pleased to provide additional information about this process.

In addition to the panel's conclusions and recommendations other important information, such as the cost of alternatives, feasibility, and their overall environmental risks and benefits will be considered. This process is designed to reach an interim control decision this summer, based on all relevant information. Concurrent with this decision, additional scientific studies are planned which will assist in refining the initial control decision. This approach is consistent with the expert panel's recommendations and recognizes that there remain a number of important, yet unanswered questions. These include the mechanisms affecting release of sediment phosphorus, and the effect of upstream nutrient sources. In this regard, I would add that the Monocacy Basin has been designated by Maryland as a priority watershed for control of non-point, agricultural nutrients. This designation carries with it the availability of existing best management practice cost-sharing from the State and the Chesapeake Bay Program.

Chesapeake Bay

Improvement of the quality of the Potomac is important not only to the river and the residents of the metropolitan area, but to the Chesapeake Bay as a whole. After seven years of scientific and management studies, an historic agreement was reached in December 1983 among EPA and the four Bay states. We have entered an implementation phase whose initial milestone is scheduled to take place this July when a multi-year plan will be considered for adoption by the Chesapeake Bay Executive Council. To put control programs in perspective, I want to assure the Subcommittee that programs underway and expected to be implemented to protect the Potomac will take into account the need to protect the Bay.

I also want to assure the Subcommittee of the continuing support of the Bay Program by the President, EPA and other Federal agencies.

Other Water Quality Issues

In the last year, two other Potomac River water quality issues have received considerable attention: hydrilla and dioxin.

Hydrilla

Hydrilla, which is a submerged aquatic plant, was inadvertently transplanted into a tributary of the Potomac in 1982. It has since spread to occupy approximately 400 acres of shoreline in the tidal freshwater zone in and around the District. This can represent a nuisance. There is, however, a lack of agreement among scientists about the potential impact of the plant. For example, despite some negative effects, many biologists believe that Hydrilla performs many of the functions in the Potomac ecosystem as native submerged vegetation. These include shoreline stabilization, nutrient uptake and production of useful organic detritus, sediment deposition, water clarification, and provision of shelter and food for organisms. Because Hydrilla grows densest in locations that had been devoid of aquatic vegetation, it may, in fact, be beneficial to the Potomac ecosystem.

The Hydrilla Regional Action Committee (HYDRAC), under the direction of the Interstate Commission on the Potomac River Basin, was formed to coordinate the activities of many local, State and Federal agencies. EPA is represented on the Committee by our Chesapeake Bay Program.

Although there have been several proposals to use herbicides to control Hydrilla, EPA and the States of Maryland and Virginia oppose this approach. We understand that there are no plans to use herbicides at this time. The situation is being closely monitored by the HYDRAC member agencies, and proper coordination will take place before any control approach is adopted.

Dioxin

As part of EPA's national study of dioxin, samples were recently taken at and near the Alexandria site of the former R. H. Bogle plant. The plant was operated from the 1920s through the mid-1970s, and dioxin-contaminated herbicides may have been handled, blended or formulated there. The Bogle site is one of approximately 80 sites in the nation within this category.

The results of our sampling show that dioxin was not detectable in soil near the former plant. Dioxin concentrations in several Potomac River sediment samples ranged from less than 1 part per trillion (ppt) to 23 ppt. While there are no standards or guidelines for evaluating dioxin in sediments, we will use the results of the sampling to evaluate any dredging projects for their potential impact on the bioavailability of dioxin in the estuary. Analyses also showed that fish collected near the site contained 6.3 ppt or less, which is considerably lower than an action level of 25 ppt identified by the Food and Drug Administration for fish in the

Intergovernmental Cooperation

It has been recognized for many years that Potomac River water quality can be improved only if EPA, the States and many local jurisdictions cooperate in both collecting, analyzing and interpreting water quality data, on the one hand, while planning for and deciding on basic control decisions. What became known as the Potomac Strategy was created in April 1979 to improve coordination of the various water quality programs being undertaken by all levels of government in the DC Metro area. The chief administrative officers of the several local jurisdictions, ably chaired by County Executive J. Hamilton Lambert, regularly meet to coordinate local views and activities.

In 1979, as it is today, the most fundamental question has been "How much treatment is needed to achieve water quality standards in the Potomac?" It was generally seen that improvements had to be made to the water quality model, and that additional water quality data analyzed by an improved model would yield more reliable conclusions upon which to make water quality management decisions. Water quality data collection and technical modelling studies form the core of the Potomac Strategy, which is managed by EPA, the District, Maryland and Virginia, with active participation by the Council of Governments and Interstate Commission on the Potomac River Basin. Indeed, the expert panel appointed to study the 1983 algae bloom did its work within the management framework of the Potomac Strategy. Exhibit 5 illustrates the Potomac Strategy.

While today's hearing may not be the appropriate forum to discuss the fascinating, if often esoteric, technical aspects of implementing the Potomac Strategy, I want to point out to the Subcommittee that EPA has continuously advocated and supported the fundamental importance of intergovernmental cooperation in the Clean Water Act's planning and construction grant program as well. The most recent example of Federal and local recognition of this metropolitan approach is a Memorandum of Understanding signed in September 1984 to lead to an interjurisdictional agreement on the allocation of capacity and financial responsibility for operation of Blue Plains. EPA will continue to insist that the pledge by the chief administrative officers be honored to promptly reach a long term agreement. I believe that all parties are acting vigorously to achieve an agreement, and that one will be completed in the very near future. Let me emphasize that an agreement is not an end in itself, but will provide the framework for resolving the most important water quality management issues in the area.

Blue Plains Wastewater Treatment Plant

It is not surprising that discussions of regional environmental cooperation often center on the Blue Plains Wastewater Treatment Plant.

While the facility is owned and operated by the District, it also serves parts of Montgomery and Prince Georges Counties in Maryland, and Fairfax County, Virginia.

Blue Plains is, by any standard, a very large and complex treatment works. Indeed, with a capacity of 309 million gallons per day (mgd), peak flows at the rate of 650 mgd, and one of the nation's most stringent effluent discharge permits, operating and maintaining Blue Plains is one of the District's most challenging jobs.

Performance at Blue Plains has improved very significantly in recent years, and is continuing to improve. It now regularly meets its advanced waste treatment requirements for BOD (5 mg/l), total suspended solids (7 mg/l), and phosphorus (0.22 mg/l).

Recognizing that plant maintenance is a key factor in both improving performance and increasing the life of the facility, EPA's National Enforcement Investigation Center studied Blue Plains in 1984 and concluded that inadequate preventive and remedial maintenance increased the difficulty of routinely meeting effluent limits as well as greatly reducing the longevity of major plant equipment. I would add that EPA's motivation to assist the District in identifying operating difficulties was two-fold: to protect the Potomac River and Chesapeake Bay, as well as to preserve a Federal investment of $310 million. An unambiguous indicator of the level of maintenance at any treatment plant is the number of maintenance workers employed, and Blue Plains was employing only a fraction of the workers needed: 88 maintenance workers were employed, as compared to an estimated need for more than 300. This inadequate manpower showed itself clearly in the condition of major and minor equipment.

EPA responded to this situation by negotiating a consent decree with the District. Lodged in September 1984 and entered in January 1985, the consent decree contains specific maintenance requirements in terms of manpower and equipment repair. The consent decree also specified compliance with all effluent limits and pretreatment requirements.

I am pleased to be able to report to the Subcommittee that the District, with minor exceptions, is in substantial compliance with the terms of the consent decree:

- as interim requirements toward the long-term need for more than 300 additional positions, augmentation of the maintenance (36) and operations (27) staffs is taking place on schedule.
- hundreds of pieces of equipment have been repaired or replaced, and the few remaining inoperable parts will be repaired or replaced as soon as ordered parts are obtained;
- compliance with effluent limits of the NPDES permit has been largely achieved, with the exception of a minor pH violation in January 1985;
- a spare parts inventory and several operations and maintenance manuals have been submitted; and
- $200,000 has been set aside by the District for an environmentally beneficial project, and $50,000 was paid to the Federal government, both included in the consent decree as penalties for previous noncompliance with the discharge permit.

In summary, EPA and the District recognized the importance of significantly improving the operation and maintenance of Blue Plains, negotiated a very specific consent decree to implement these improvements, and the District is in substantial compliance with all significant requirements. Monthly status reports allow EPA to closely monitor the District's performance. Given the stringency of the decree and the precedent-setting level of effort required for compliance, EPA is pleased with the District's performance.

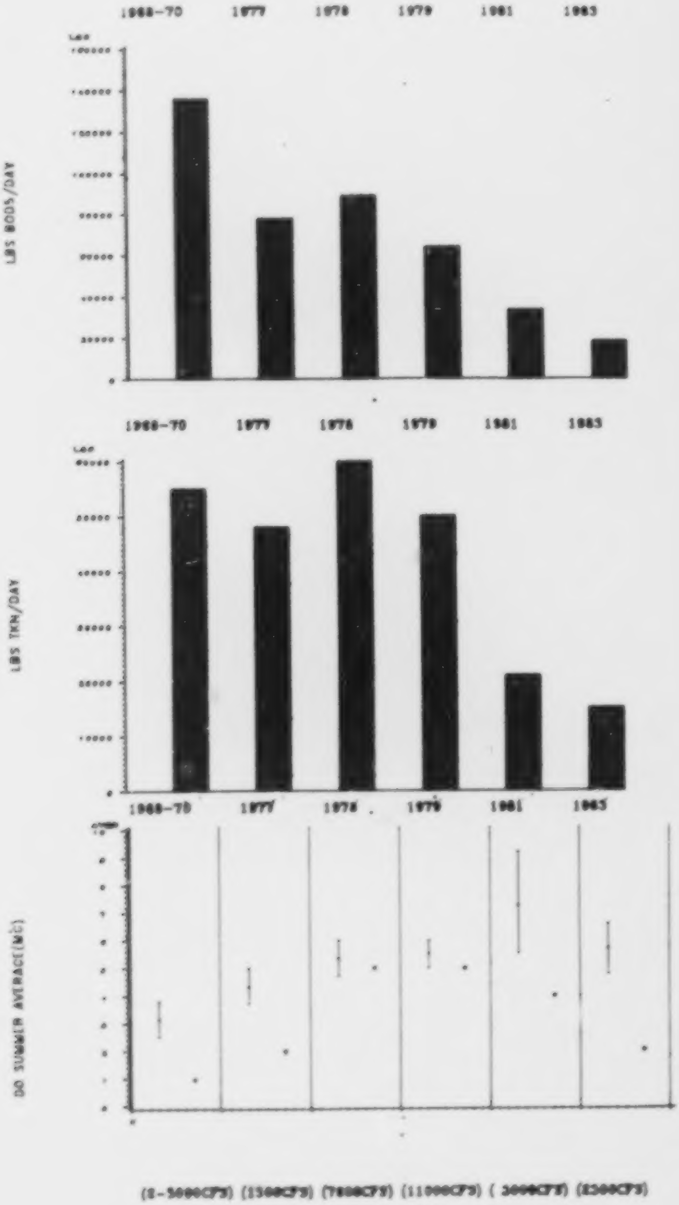
EPA is also pleased with progress made in the last year by the Blue Plains user jurisdictions in addressing long term sludge disposal needs. After many years of delays, missed deadlines and permit violations, the District and her sister jurisdictions negotiated a five year interim agreement. Congressman Stan Parris hosted a meeting last February, at which the agreement was signed and a discussion took place concerning alternate technologies for treating and disposing of sludge. All parties agreed that sludge should not again be allowed to accumulate at Blue Plains. Mr. Chairman, you may also recall hearing about a delightful luncheon hosted by Mayor Barry last spring at Blue Plains, celebrating the five year agreement and removal of the long-growing sludge pile. Further, a twenty year sludge program has been largely identified and will be embodied in a new intermunicipal agreement which I referred to a few minutes ago. Thus, we have come a long way in the last year and we have reason to be optimistic that a long term sludge program for Blue Plains will soon be in place.

Conclusion

Mr. Chairman, I believe that the improvement which has taken place in the Potomac River is a success story that demonstrates what can be accomplished where intergovernmental cooperation and long-range planning are sustained for many years. The Subcommittee is to be commended for its longstanding interest in the quality of the Potomac River and its numerous intergovernmental and technical aspects. I hope that my testimony and that of my colleagues today is helpful to the Subcommittee in understanding both trends in the condition of the river, as well as recent and current activities aimed at continuing the job of improving it. After a billion dollar investment by the Federal and local governments, we should never lose our dedication to the Potomac and the Chesapeake Bay into which it flows.

I would be pleased at this time to respond to any questions of interest to the Subcommittee.

EXHIBIT 1 - Potomac Estuary Comparison of Oxygen Demanding Point Source Loads and DO Response for Different Years



(Numbers in parentheses are summer average flows at Little Falls)

EXHIBIT 2 – FECAL COLIFORM TREND POTOMAC RIVER – WOODROW WILSON BRIDGE (RANGE OF QUARTERLY GEOMETRIC MEANS)

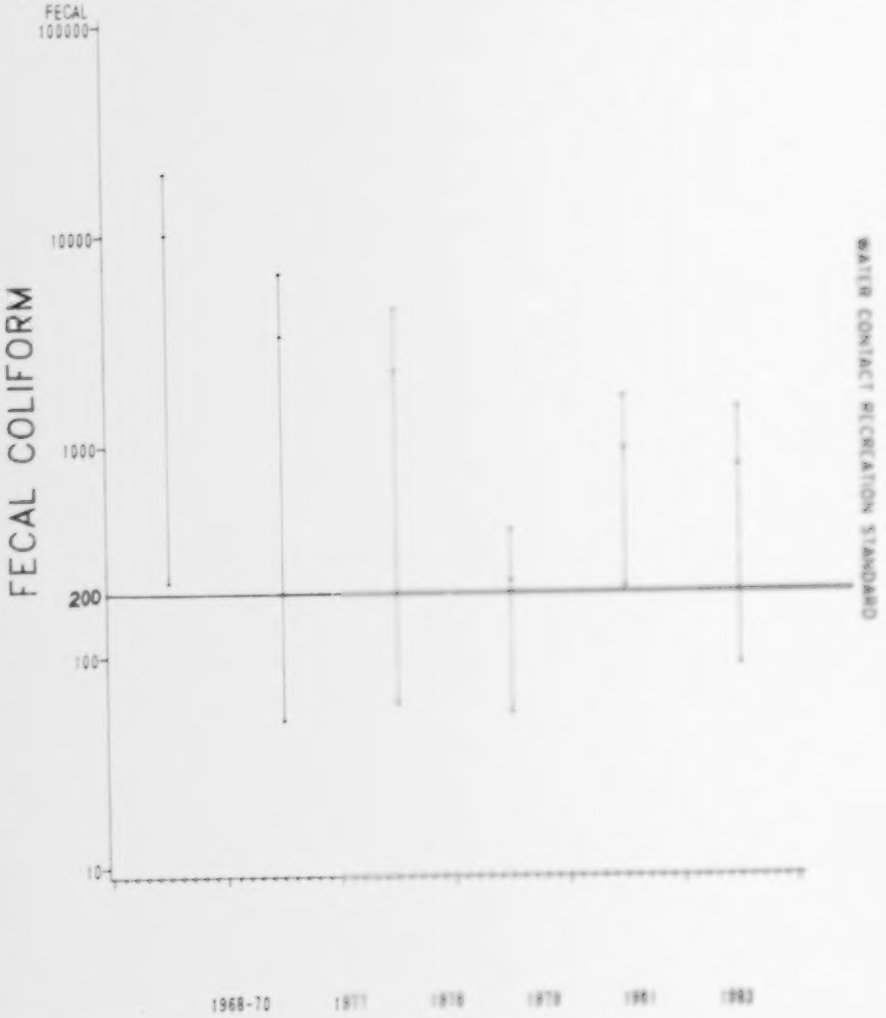


EXHIBIT 5 – POINT SOURCE LOADS, CHLOROPHYLL LEVELS AND POTOMAC RIVER FLOW FOR VARIOUS YEARS

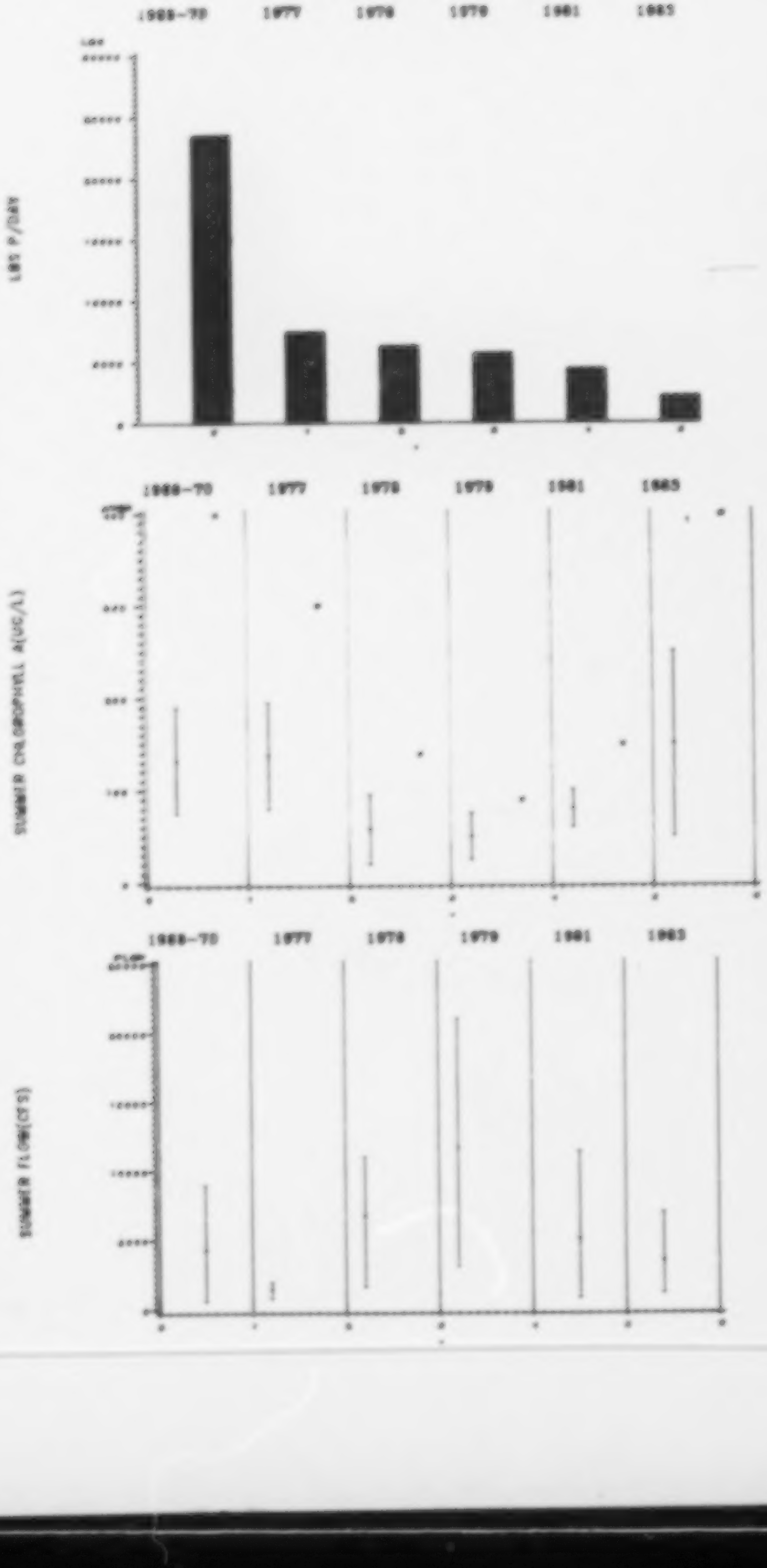


EXHIBIT 4

PROCESS TO DEVELOP ALGAL BLOOM CONTROLS

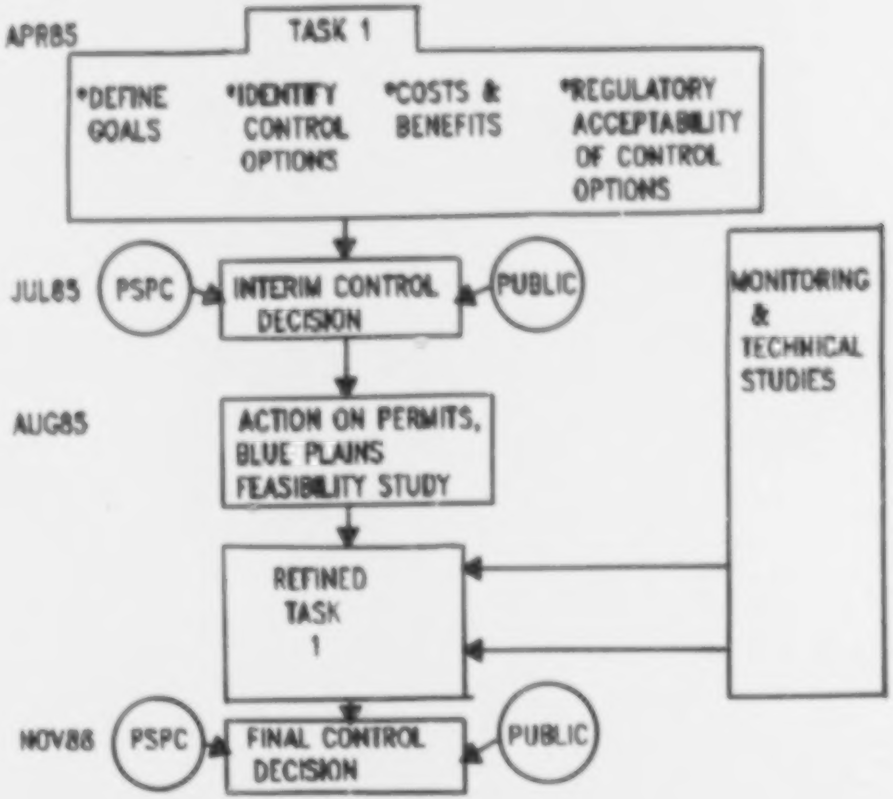
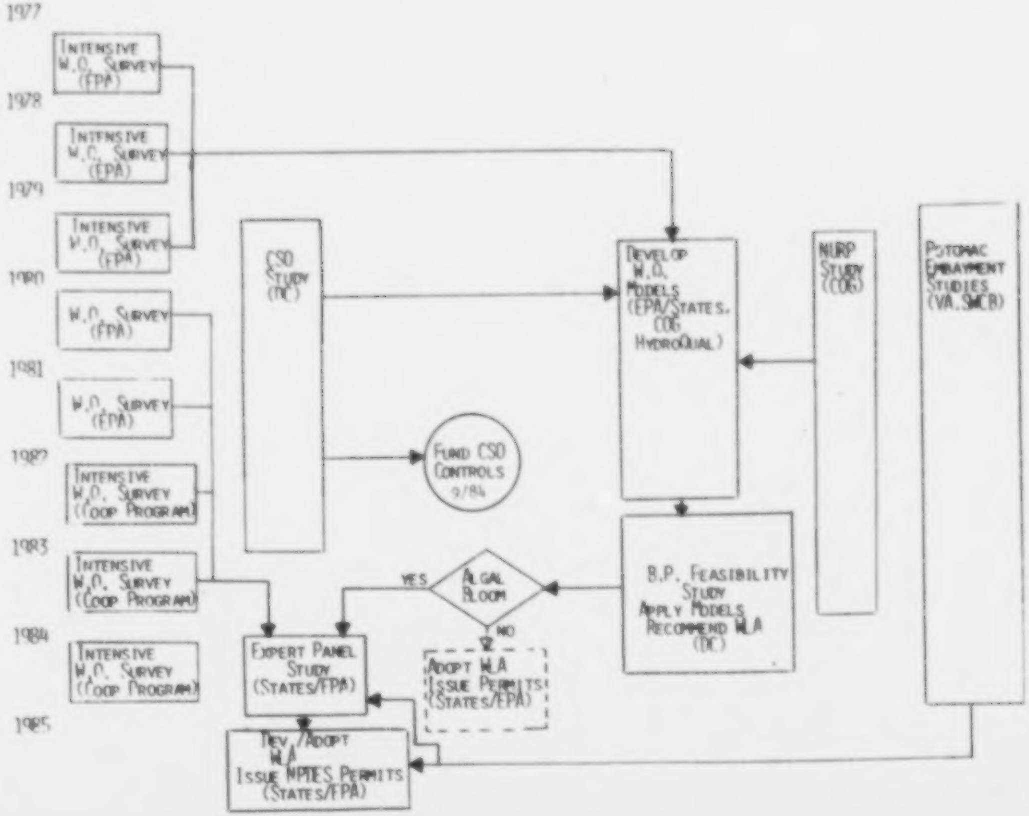

APR85
TASK 1
*DEFINE GOALS
*IDENTIFY CONTROL OPTIONS
*COSTS & BENEFITS
*REGULATORY ACCEPTABILITY OF CONTROL OPTIONS
JUL85
PSPC
INTERIM CONTROL DECISION
PUBLIC
AUG85
ACTION ON PERMITS, BLUE PLAINS FEASIBILITY STUDY
REFINED TASK 1
MONITORING & TECHNICAL STUDIES
NOV88
PSPC
FINAL CONTROL DECISION
PUBLIC

EXHIBIT [illegible]

POTOMAC STRATEGY


1977
1978
1979
1980
1981
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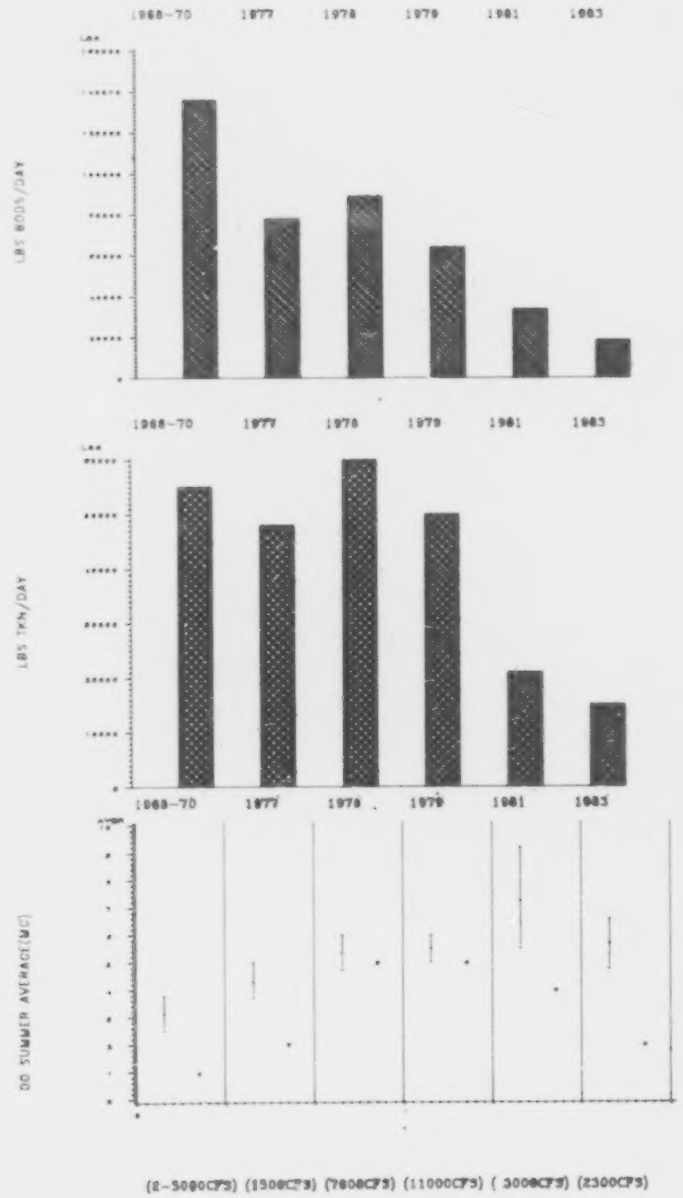
INTENSIVE W.Q. SURVEY (EPA)
INTENSIVE W.Q. SURVEY (EPA)
INTENSIVE W.Q. SURVEY (EPA)
W.Q. SURVEY (EPA)
W.Q. SURVEY (EPA)
INTENSIVE W.Q. SURVEY ((COOP PROGRAM)
INTENSIVE W.Q. SURVEY ((COOP PROGRAM)
INTENSIVE W.Q. SURVEY ((COOP PROGRAM)
CSO STUDY (DC)
FUND CSO CONTROLS 9/84
DEVELOP W.Q. MODELS (EPA/STATES, COG HYDROQUAL)
NURP STUDY (COG)
POTOMAC EMBAYMENT STUDIES (VA.SWCB)
B.P. FEASIBILITY STUDY APPLY MODELS RECOMMEND WLA (DC)
ALGAL BLOOM
YES
NO
ADOPT WLA ISSUE PERMITS (STATES/EPA)
EXPERT PANEL STUDY (STATES/EPA)
REV./ADOPT WLA ISSUE NPDES PERMITS (STATES/EPA)

EXHIBIT I - Potomac Estuary Comparison of Oxygen Demanding Point Source Loads and DO Response for Different Years

I



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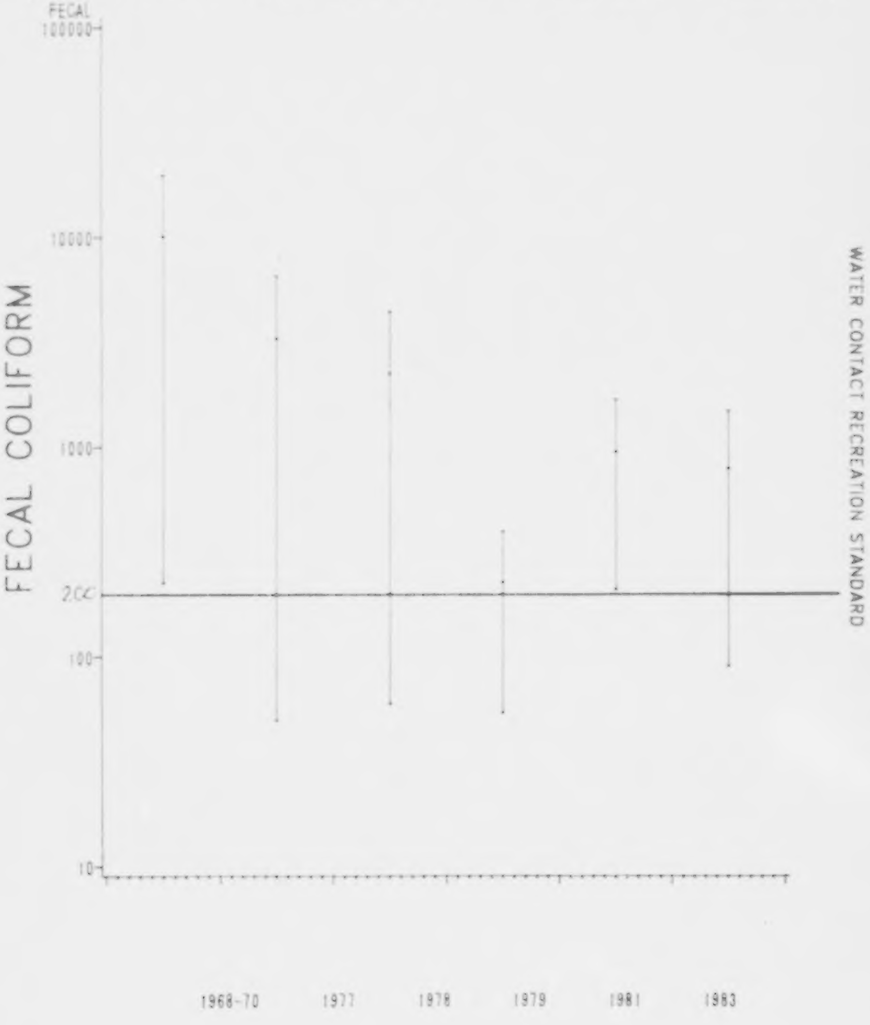

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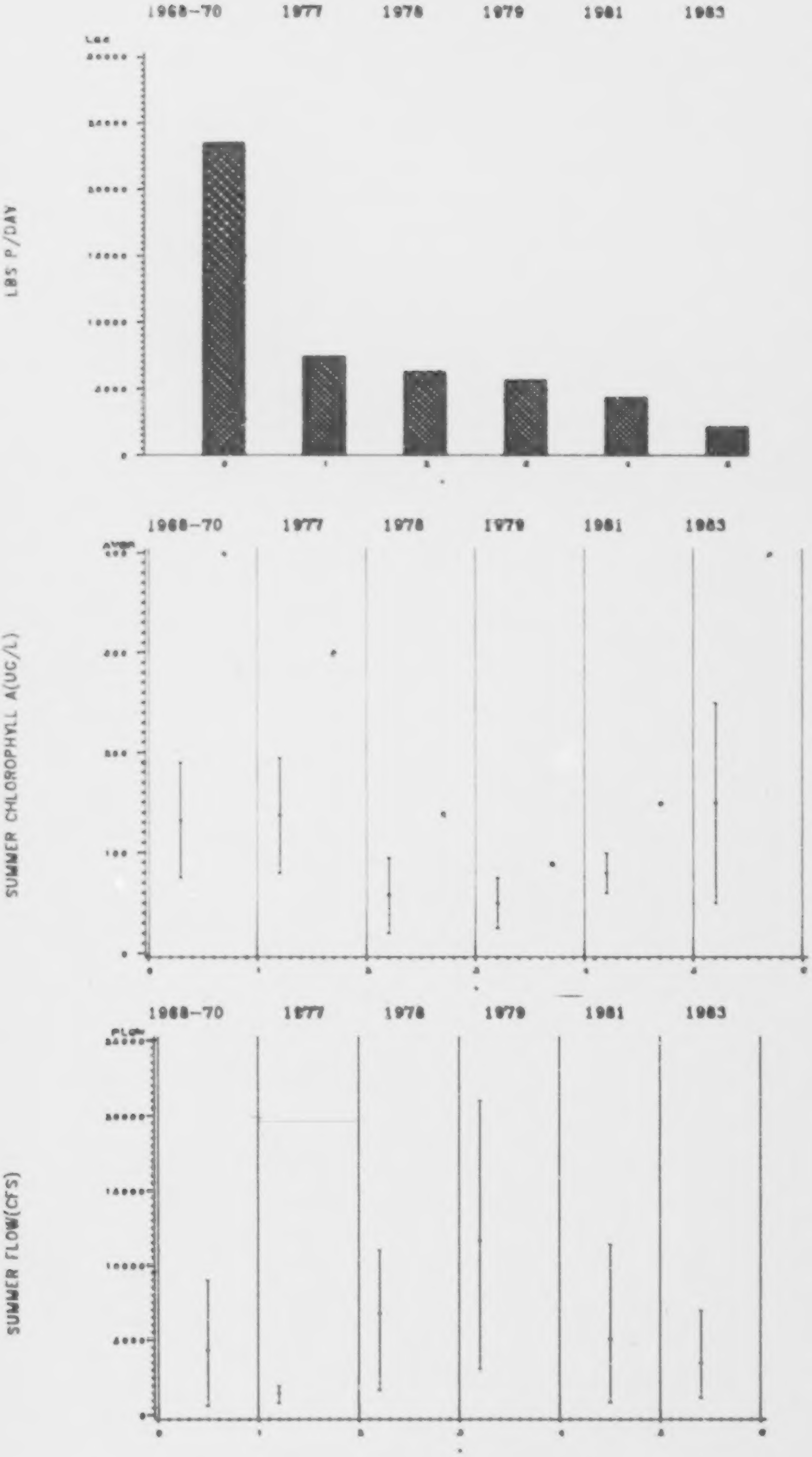

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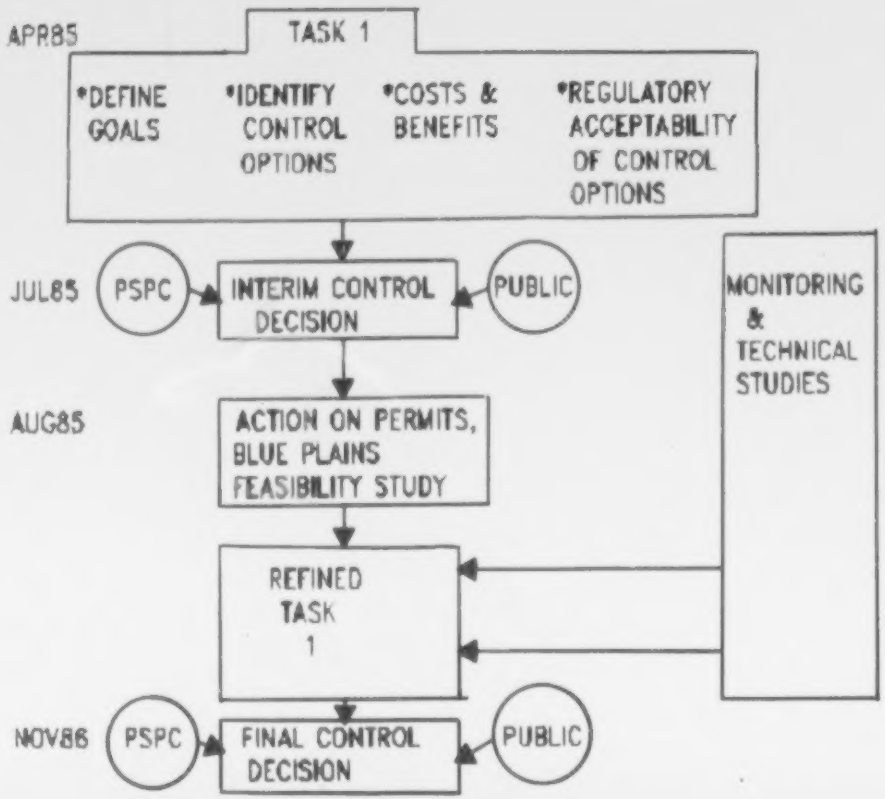
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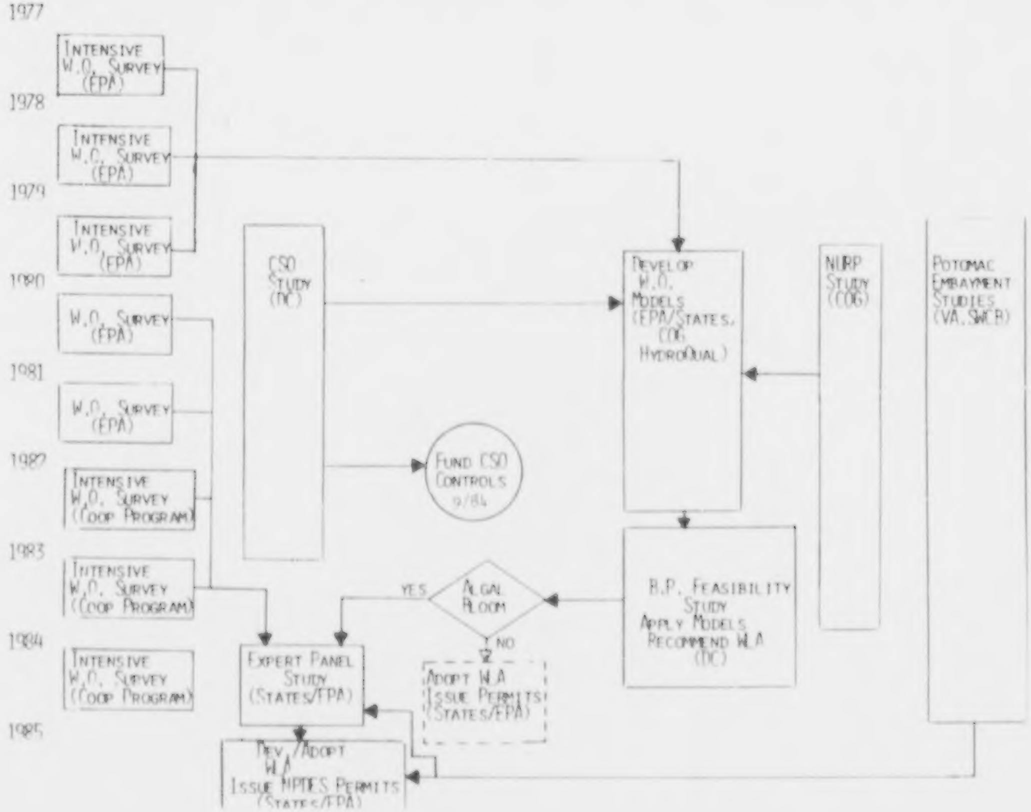
NOV86
PSPC
FINAL CONTROL DECISION
PUBLIC

EXHIBIT 5

POTOMAC STRATEGY


1977
1978
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INTENSIVE W.Q. SURVEY (EPA)
INTENSIVE W.Q. SURVEY (EPA)
INTENSIVE W.Q. SURVEY (EPA)
W.Q. SURVEY (EPA)
W.Q. SURVEY (EPA)
INTENSIVE W.Q. SURVEY (COOP PROGRAM)
INTENSIVE W.Q. SURVEY (COOP PROGRAM)
INTENSIVE W.Q. SURVEY (COOP PROGRAM)
CSO STUDY (DC)
FUND CSO CONTROLS 9/84
DEVELOP W.Q. MODELS (EPA/STATES, COG HYDROQUAL)
NURP STUDY (COG)
POTOMAC EMBAYMENT STUDIES (VA. SWCB)
B.P. FEASIBILITY STUDY APPLY MODELS RECOMMEND WLA (DC)
ALGAL BLOOM
YES
NO
ADOPT WLA ISSUE PERMITS (STATES/EPA)
EXPERT PANEL STUDY (STATES/EPA)
DEV./ADOPT WLA ISSUE NPDES PERMITS (STATES/EPA)

Mr. **Barnes**. Our next witness is Colonel Walsh. Colonel, did you want to present your testimony now on the water-quality issues?

Colonel **Walsh**. Yes, sir.

Mr. **Barnes**. Thank you.

STATEMENT OF COL. MARTIN WALSH, JR., U.S. ARMY CORPS OF ENGINEERS

Colonel **Walsh**. Mr. Chairman and members of the committee, I am pleased to appear again before your committee to discuss what the U.S. Army Corps of Engineers is doing to develop a control program for hydrilla in the Potomac River.

With your permission, Mr. Chairman, I would like to proceed by presenting an overview of my formal statement, which will be submitted for the record.

My statement will cover four areas. First, hydrilla's introduction into this country and into the Potomac River. Second, how the Corps of Engineers became involved. Third, our research and testing program, and finally, our schedule to develop a control program.

Hydrilla is a species of aquatic plant that was first discovered in this Nation in Florida about 1960. The plant probably was introduced from the Far East as part of the aquarium trade. It closely resembles another aquatic plant, elodea, which is popular within the aquarium industry. Hydrilla has spread rapidly across North America, reaching problem levels in most water bodies where it has been found. The plant's broad tolerance has enabled it to thrive in the differing environments of Florida, Texas, California, Iowa, and Connecticut.

Hydrilla can withstand wide variations in both pH and nutrient levels. It thrives in water temperatures greater than 17 °C—about 62 °F—and in salinity levels less than 12 to 15 parts per 1,000. With this wide range of environmental tolerances, hydrilla has the potential to spread throughout the United States. The plant has no natural enemies in this country.

Once introduced, it usually spreads until it dominates an entire body of water, growing an average of 1 inch each day. Because it can reproduce by fragmentation, among other ways, a portion of the plant can be taken out of water, remain dormant for several months, and then still reroot once placed back in water.

As you can see on the chart to my left, hydrilla was first identified in the Potomac River in 1982 when about 10 acres at Dyke Marsh were found to be infested. Since then, the plant has spread to some 600 acres as of this past year. The presence of hydrilla created serious problems in the Potomac River for recreationists and property owners.

It restricts boating and other recreational uses of shallow water areas by forming thick impenetrable mats. It has clogged access to several marinas on the Virginia side of the waterway. Further, it collects and holds floating debris, chokes out native vegetation, increases mosquito habitat, and deprives game fish by protecting their prey.

Recognizing this potential threat, Maryland and Virginia each sent letters to the corps in 1984 asking that we conduct a study of hydrilla in the Potomac River. We received other formal expressions of support from Congressmen, local officials, commissions, community organizations, and special interest groups.

The corps started a reconnaissance study of the problem in June 1984, under the authority of section 302 of the 1965 Rivers and Harbors Act. This section authorizes the corps to develop a comprehensive control program for obnoxious aquatic plant growths in navigable waters, tributaries, connecting channels and other allied waters of the United States. The cost of the reconnaissance study and of the subsequent development of the control program is borne 100 percent by the Federal Government.

Presently, the cost of actually initiating a control program must be shared 70 percent Federal and 30 percent with a local sponsor or beneficiary. The administration has proposed that cost-sharing be revised to reflect a 50-50 sharing of control costs. To date, $240,000 was spent in fiscal year 1984, and we anticipate spending $620,000 this fiscal year. Of that money, 84 percent will be used for research and development.

In developing a control program for hydrilla in the Potomac River, we have sought the help of various educational and scientific institutions; we have searched the records of attempts in other parts of the country to control the plant; and we have run small-scaled, controlled testing at corps and Department of Agriculture laboratories and in the Potomac River.

Following the completion of our reconnaissance report last summer, we were able to run several field tests in the Potomac River. We tested the use of a mechanical harvester at two marinas in Virginia and in Broad Creek in Maryland.

The harvester is a floating cutter/collection system that mows plant material up to a depth of 5 feet. The harvested plant material is then off-loaded and disposed of upland. Our testing demonstrated that harvesting in the Potomac River is feasible.

On the average, the harvester was able to clear about one-quarter acre each hour. Estimate from this test established the cost of harvesting in the Potomac at about $600 per acre. While this method of control does cause plant fragmentation, we have concluded that by using appropriate operational controls, the spread of the plant because of harvesting would be minimized.

In 1984, we also tested the placement of barrier mats on the channel bottom at Swan Creek along the Maryland shore. These mats block out light which the plant needs to survive and provide a physical barrier through which the plant cannot penetrate.

Because of their high cost and vulnerability to the elements, mats are most appropriate in small areas in and around boat slips. Barrier mats cost from $43,000 to $44,000 per acre.

A third element of our 1984 field testing was to be the controlled use of the herbicide Diquat in three 2-acre plots near the Virginia shore. Diquat was chosen because it is the only herbicide approved for use in free-flowing streams by the Environmental Protection Agency. It also is being used successfully against hydrilla in Florida, Louisiana, and North Carolina, providing environmentally safe and cost-effective control. This element of the testing program was postponed, however, because of the onset of colder weather which caused the plant to begin dying back.

Our testing in 1985 is designed to complement our efforts of last season. We will further investigate barrier film materials. We will test both a diver-assisted dredge and transplanting native aquatic plants to halt the spread of hydrilla. During this year, we also will monitor the return of the plant in areas that were cleared by mechanical harvesting in 1984.

Last week, approximately one-half acre of new barrier material was placed within the Old Town Yacht Basin in Alexandria, VA. This test will show us how long it will take and what problems we will encounter placing and maintaining barrier film in a relatively confined marina area. In addition, we will continue to monitor our barrier film placement in Swan Creek to determine its stability during the winter months, to measure sedimentation on top of the film and to measure the encroachment of hydrilla from the surrounding unmatted area.

This June, we will test a diver-operated dredging operation at Belle Haven Marina on the Virginia shore. A pair of divers will use a suction apparatus to selectively remove hydrilla from this confined marina area. This method has been used previously in New York, Wisconsin, California, and Canada. Our testing should tell us if a diver-dredge operation is feasible or cost-effective in the Potomac River where turbidity could be a problem.

We are preparing to transplant native aquatic plants in two 12-meter by 6-meter plots at four separate locations along both the Maryland and Virginia shore. Transplanting should begin within the next several weeks, followed by monitoring to determine if any native plants can prevent the spread of hydrilla. We are working with the U.S. Fish and Wildlife Service, U.S. Geological Survey, Virginia Institute of Marine Science, University of Maryland, and both States in conducting this test.

For 1985, we again proposed to test both the effectiveness of the herbicide Diquat and the herbicide's fate and environmental persistence in the Potomac River. Research we have done indicates that in the southern region of this Nation, where herbicides are used to control the spread of hydrilla, this method is the least costly and most effective. However, this research also indicates that Diquat is less effective in turbid waters, a condition prevalent in the Potomac River. Our proposed controlled, small-scale testing would provide answers on the effectiveness of Diquat in the Potomac with negligible impacts to the environment.

Our proposed herbicide testing was coordinated with Federal and State agencies and congressional and environmental interests. The concurrence of both States was requested and a series of staff-level meetings held to discuss the program in detail. Each State opposed testing herbicides, yet continued to support our evaluation of all possible methods of hydrilla control. Because of the States' positions, we are not testing Diquat in the Potomac at this time.

In addition to our field testing, we also will test control methods and hydrilla's characteristics of reproduction and growth in our laboratory research program. We also will continue to survey the spread of hydrilla in the Potomac to include both the area infested and the density of the plant, among other factors.

As I have said previously, hydrilla has no natural enemies and once introduced into a body of water, it spreads until it dominates.

In 1982, hydrilla covered 10 acres of the Potomac River. In 1984, the acreage increased to 600. Given the suitable water quality conditions which now exist in the river and hydrilla's known rate of reproduction, it is possible, as shown in the chart being set up now, that more than 34,000 acres of the waterway between Washington, DC, and the Route 301 bridge could become infested by the plant over the next 10 years and create serious problems for both property owners and river users.

I also should mention that there are many areas within Chesapeake Bay where hydrilla could thrive because of suitable environmental conditions.

A key factor determining future growth of submerged aquatic vegetation is the quality of water. Water quality has improved substantially over the past 5 years. Point source pollution controls have contributed significantly to recent improvements in water quality and to the resurgence of aquatic plants in the upper Potomac. As the quality of water continues to improve, it will sustain the spread of aquatic vegetation, including hydrilla.

By the end of the 1984 boating season, hydrilla had substantially affected recreational boating activities at two marina facilities along the Virginia shore and numerous private property owners between Alexandria and Mount Vernon along both sides of the river. Boaters' navigational difficulties were particularly troublesome during the fall die-back of hydrilla when large mats of decaying hydrilla floated downstream. There are approximately 75 marina activities, including commercial fishing and charter operations, between Washington, DC, and the Route 301 bridge which could feel the impacts of hydrilla in the future.

To prevent this from happening, control operations could begin in 1986, provided agreement on a program and the necessary cost-sharing can be reached between the corps, Maryland, Virginia, and the District of Columbia. We believe that the most prudent approach to dealing with any interjurisdictional problem is a regional plan involving all of the affected parties.

We have formed a Potomac River Hydrilla Management Committee in conjunction with the Metropolitan Washington Council of Governments. This committee, with representatives from the States, local jurisdictions, and National Park Service, will be asked to participate in a joint Federal/non-Federal program and secure necessary non-Federal funding to help finance control and management operations. This Federal/non-Federal partnership must be secured if future control of hydrilla is to be realized under the corps aquatic plant program.

Thank you very much.

[The prepared statement with attachments of Colonel Walsh follow:]

STATEMENT OF
COLONEL MARTIN W. WALSH, Jr.
DISTRICT ENGINEER
BALTIMORE DISTRICT, CORPS OF ENGINEERS

before the
Subcommittee on Government Operations
and Metropolitan Affairs
Committee on the District of Columbia
U.S. House of Representatives

Thank you for the opportunity to appear before the committee today to respond to your questions on hydrilla, flood protection and river safety. I will address each topic separately.

I. HYDRILLA

BACKGROUND

During the past three years, hydrilla (Hydrilla verticillata), a highly competitive non-native submerged aquatic plant, has become established in the Potomac River from Alexandria to Mount Vernon, Virginia. The plant is believed to have been inadvertently introduced as part of a program to reestablish beneficial submerged aquatic vegetation (SAV) in the tidal freshwater portion of the river which had been previously devoid of SAV for years. Since its introduction, the plant has spread rapidly to about 600 acres of the the waterway and has started to create serious problems by restricting boating and other recreational uses of shallow water areas. Based on past experience with the Florida variety (dioecious) in the southern United States, the continued spread of the Potomac River biotype (monoecious) of hydrilla could present a severe management problem in the entire upper one-third of the Potomac estuary.

In recognition of this potential threat, the State of Maryland and Commonwealth of Virginia made formal application to the Baltimore District, Corps of Engineers for a study of hydrilla in letters dated 29 June 1984 and 11 September 1984, respectively. Other formal expressions of support for a Corps study and aquatic plant control program have been provided by Congressmen, other elected local officials, the Interstate Commission on the Potomac River Basin, the Metropolitan Washington Council of Governments, and numerous community associations and special interest groups.

In response to these requests the Corps initiated action under the general continuing authority of Section 302 of the Rivers and Harbors Act of 1965 which states in part:

> "There is hereby authorized a comprehensive program to provide for control and progressive eradication of water-hyacinth, alligatorweed, Eurasian watermilfoil, and other obnoxious aquatic plant growths, from the navigable waters, tributary streams, connecting channels, and other allied waters of the United States, in the combined interest of navigation, flood control, drainage, agriculture, fish and wildlife conservation, public health, and related purposes, including continued

research for development of the most effective and economic control measures, to be administered by the Chief of Engineers, under the direction of the Secretary of the Army, in cooperation with other Federal and state agencies. Local interests shall agree to hold and save the United States free from claims that may occur from control operations and to participate to the extent of 30 per centum of the cost of such operations. Cost for research and planning undertaken pursuant to the authorities of this section shall be borne fully by the Federal Government."

HISTORY AND DESCRIPTION

Since 1983, about a dozen species of aquatic plants have become established in the tidal freshwater portion of the river above Quantico, Virginia. The reappearance of aquatic plants is widely viewed as a welcome trend and an indication that water quality conditions in the Potomac River are improving. The presence of lush beds of SAV has been irregular over the past century. During the 1920's and 1930's there was a general decline in all species of SAV in the Potomac River. Since then, with the exception of a brief period during the early 1960's when Eurasian watermilfoil became widespread, SAV has generally been scarce. The late 1960's and 1970's were a period in which virtually no submerged plants were found in the Potomac River above Quantico, Virginia.

While the overall return of SAV is an encouraging development, hydrilla which is known to be a particularly troublesome species, has also become locally abundant. The appearance and rapid spread of hydrilla in the Potomac River is of particular concern to the affected states, and the District of Columbia, and those who use the waterbody for recreation, commercial navigation, fishing and other activities. This concern stems from knowledge of the plant's demonstrated aggressiveness in other lakes and rivers throughout the United States and its potential for creating serious problems.

Hydrilla, a monocotyledon, considered to be monotypic in the family Hydrocharitaceae, is an exotic submersed aquatic plant. It was first discovered in Florida in 1960 and was apparently introduced from the Middle East with the aquarium trade. Since 1960, it has spread rapidly across North America and has reached problem levels in most water bodies where it has become established. Its broad ecological variability has enabled it to thrive in riverine and lacustrine environments in the southeastern United States, in irrigation and drainage canals in California, and in water bodies as far north as Ireland (about 35 degrees North). It can withstand wide variations in pH, alkalinity, nutrient levels, and thrives at water temperatures above 17 degrees C. Its salinity limit is about 12 to 15 parts per thousand (ppt). With this wide range of environmental tolerances, hydrilla has the potential for establishment throughout the United States. Hydrilla is able to rapidly dominate an entire body of water through its very efficient means of reproduction. The monoecious (producing male and female flowers) biotype found in the Potomac River reproduces in six ways:

(1) Winter-buds (axillary turions) which develop at nodes of upright stems.

(2) By tubers (subterranean turions) which develop within the hydrosoil. These tubers can grow to 4 or more inches below the hydrosoil surface and have been known to remain dormant up to 10 years.

(3) By runners along the bottom surface.

(4) By rhizomes, horizontal stems under the hydrosoil.

(5) By root and leaf fragments which break loose, sink to the bottom, and establish new colonies.

(6) By seed. This last method, unknown in Florida where the dioecious (female flower only) is found, is of special concern because sexual reproduction allows for evolution and adaptation to the environment.

Hydrilla is an aggresive competitor that often excludes existing populations of beneficial native aquatic macrophyte species from the aquatic ecosystem. It has no natural enemies on this continent. An important factor in its ability to dominate a habitat is its low light compensation point. This allows hydrilla to begin growth sooner in the spring and to grow deeper in the water than most native species, a distinct competitive advantage. In some rare cases hydrilla has been found growing at depths of up to 50 feet in extremely clear water. It is generally a problem only at shallower depths (15 to 20 feet or less) and in the Potomac River it has not been found in greater than seven feet of water. Given these competitive advantages, we anticipate that hydrilla will prove to be a dominant and troublesome species in the Potomac River in future years. Hydrilla characteristically forms thick, nearly impregnable mats of stems and leaves at and below the water surface and consequently collects and holds floating debris, impacts commercial navigation and water based recreational activity, shades out and outcompetes more benefical SAV, increases mosquito and pest habitat, and deprives game fish by protecting their prey. Many of these adverse impacts were noted in localized areas along the Potomac shoreline during 1984 and similar problems are anticipated in many additional areas during the upcoming growing season.

Conversely hydrilla can provide some beneficial values similar to native SAV in the Chesapeake Bay. Native SAV's in the Chesapeake Bay Area are functionally important in the aquatic ecosystem because they superimpose a structural component on an otherwise bare sand or mud bottom. This structure serves as a habitat for many vertebrate and invertebrate species such that the density and diversity of animal life is significantly higher than adjacent, unvegetated areas. In addition, SAV areas serve as refuge for some early life stages of fish and invertebrates. The spawning activities of some organisms require SAV's. Furthermore, they help stabilize sediments and reduce shoreline erosion, serve as nutrient traps for dissolved phosphorus and nitrogen, improve water quality by removing noxious substances from the water, and provide an important source of detritus. The ability to assimilate inorganic substances into organic compounds usable by other organisms enhances the importance of these plants as a vital link in the food chain. Though not commonly viewed as indicators of biological conditions or trends, SAV's are considered to be potentially useful as an indicator of pollution trends. While hydrilla in small amounts may contribute to the overall improvement of the environment in the Potomac estuary, it's "attributes" must be weighed against the eventuality of an over abundance of the species and the overriding negative impacts associated with it. While it is not now possible nor desirable to eradicate hydrilla because of its widespread presence in the river, the plant can be managed to minimize the conflicts it creates with waterborne related activities.

CURRENT AND ANTICIPATED PROBLEM AREAS

Within the Virginia portion of the region, hydrilla has been found in both impounded waters and the Potomac River and tributaries. At least 50 percent of a 215-acre recreational lake in Fairfax County was infested with hydrilla in 1984. Hydrilla has also been found along the Virginia side of the Potomac River between Alexandria and Dogue Creek as shown on Figure 1. The primary area of infestation is the Dyke Marsh area along the George Washington Memorial Parkway. Dyke Marsh is located in Virginia waters and is under the jurisdiction of the National Park Service. The total acreage impacted by hydrilla in the Virginia portion of the study area was estimated at 100 acres in 1984.

Similar to Virginia, hydrilla has been found in both impounded and free flowing waters of the State of Maryland. Within Maryland, the plant has been found in both Lake Needwood and Pine Lake. Both of these lakes are located in Montgomery County and are used for recreational purposes. Lake Needwood is a 74-acre lake that was approximately 50 percent infested; however, the Maryland National Capital Parks and Planning Commission (MNCPPC) treated the lake with herbicides in June 1984 and achieved effective control during the season. MNCPPC also successfully treated several other smaller impoundments with endothall last year. As shown in Figure 1 hydrilla has also been found in the Potomac River and tributaries between the Woodrow Wilson Bridge south to Chicamuxen Creek. Established colonies were noted in Broad Creek, Swan Creek and Piscataway Creek. At present Hydrilla is not found in pure stands, but occurs with other SAV's such as watermilfoil, coontail, wild celery, and redhead grass. In 1984 hydrilla was also found in scattered patches along the Maryland shoreline downstream to Mallows Bay. The total acreage infested in the Potomac River and tributaries in Maryland waters is estimated to be approximately 500 acres.

Within Washington, D.C., hydrilla has been found in a number of the architectural and environmental gardens administered by the National Park Service. These include Constitution Gardens, the Reflecting Pool and Kenilworth Gardens. Because of concerns relative to degradation of aesthetic values and the spread of the plant to other areas the Park Service has used mechanical and chemical measures to control the plant in the above areas. As shown on Figure 1 the plant has also been found in limited areas along the Alexandria waterfront between National Airport and the Woodrow Wilson Bridge.

By the end of the 1984 boating season, hydrilla had substantially impacted recreational boating activities at two marina facilities along the Virginia shore and numerous private property owners between Alexandria and Mount Vernon along both sides of the river. Boaters reported navigational difficulties particularly during the fall die-back of hydrilla when large mats of decaying hydrilla floated downstream. Approximately 75 marina activities between Washington, D.C. and the Route 301 Bridge which includes commercial and charter boat fishing activites could become impacted by hydrilla should the species continue to proliferate at its present rate. Given the suitable water quality conditions which now exist in the Potomac and hydrilla's known rate of reproduction it is possible that more than 34,000 acres of waterway within this reach could become invaded by the plant over the next ten years (Figure 2).

Water quality is a key factor in determining future SAV conditions in the river. Water quality has improved substantially over the past five years due to point source pollution controls. Reductions in the region's sewage treatment plant phosphorus discharges has contributed significantly to recent improvements in water quality which have no doubt had a good deal to do with the resurgence of SAV in the upper Potomac. While it is extremely difficult to predict water quality conditions very far into the future because of the river's dynamic character, generally improved water quality conditions should sustain the spread of SAV, including hydrilla. The upper freshwater tidal portion of the river, most notably, will show the greatest improvement due to its proximity to the regional sewage treatment system. Areas which will likely be impacted by hydrilla are the shallow flats that are less than six feet in depth and are adjacent to the main channel and tributaries. This area accounts for over 50 percent of the available water surface between the District of Columbia and Quantico, Virginia.

MANAGEMENT AND CONTROL OF HYDRILLA

Management and control of hydrilla can be accomplished using several available methods in use around the U.S. today. These methods can be grouped into chemical, mechanical/-physical, and biological control techniques.

Herbicides

Based on the experience of the Corps of Engineers' Jacksonville District in the Aquatic Plant Control Program in the State of Florida, the most cost-effective control measure is treatment with chemical herbicides that are injurious to the plants but relatively safe for fish, wildlife, and other mammals, including man. Of the 53,800 acres of aquatic plants controlled in Florida in 1984, under this program alone, approximately 13 percent or 7,200 acres involved hydrilla. The majority of aquatic plant control was for water hyacinth which is common to warm southerly climates. About ninety-nine percent of the total acreage controlled for all plants was accomplished using herbicides and about ninety-four percent of the hydrilla infested areas was also controlled using this method. Control of the small remaining acreages was accomplished largely by mechanical harvesting. Harvesting is conducted where unsatisfactory flow conditions reduces the contact time and hence effectiveness of the preferred herbicides. The program is conducted in close coordination with the Florida Fish and Game Commission and numerous state and county level agencies and is done in numerous environmentally sensitive and rich areas with no ill effects. Approximately 60 percent of the cost-shared $2.5 million program in Florida was attributable to hydrilla control in 1984 as it is more costly to treat hydrilla than it is for floating water hyacinth which can be more cheaply controlled by aerial spraying. Herbicides are the control method of choice for aquatic plants in general where such use has EPA approval and in Florida as well as many other states with aquatic plant control problems to include North Carolina, Alabama and several others.

Only herbicides that are registered for aquatic use under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) can be considered. These herbicides are copper complexes, diquat, endothall, and fluridone. Only diquat and copper complexes have a current EPA - approved label for use in flowing water and therefore only these could be used in the Potomac River at this time.

Diquat destroys plant growth by interrupting the photosynthesis process. It does not kill the entire plant as the roots remain viable and will produce new growth. There remains a number of questions regarding the effectiveness of this herbicide in the Potomac River and those questions should be resolved prior to any decision regarding the initiation of a large scale treatment program. These questions relate to the composition of the suspended particulate in the treatment areas during the hydrilla growing season, flow velocities within the treated areas, and the rate of hydrilla uptake of the diquat under these conditions. To answer these questions a small scale demonstration field test to assess the effectiveness of diquat in controlling hydrilla was proposed by the Corps for the Potomac River in Fall 1984 and Spring 1985. In separate letters, the Secretary of Natural Resources in Maryland and the Secretary of Commerce and Resources in Virginia objected to testing the herbicide. Therefore, the Corps has decided not to test the effectiveness of diquat at this time. Based on the present available data diquat's effectiveness in the Potomac River is questionable. Further evaluation of this option will be made on the basis of cost and effectiveness studies based on actual experience at other locations and on laboratory research done by the U.S. Army Corps of Engineers Waterways Experiment Station. If herbicides turn out to be safe and the most cost effective control measures for certain areas and the states remain opposed to their use, we will use methods acceptable to the states, but they will have to pay 100 percent of any costs in excess of those estimated for herbicides.

Copper complexes have been used for many years for algae control and more recently to manage hydrilla. Copper concentrations in sediments and in biological components of aquatic systems can measurably increase following repeated use, possibly resulting in adverse effects. Therefore, the use of copper complexes is not recommended as a method for controlling hydrilla in the Potomac River.

While other herbicides including endothall and fluridone have been successfully used in closed water systems such as reservoirs and ponds, additional testing will be required by EPA prior to any decision to allow full registration for their use in flowing water. Indications are that full endothall labelling is three to four years off whereas fluridone may be available for use within a year. Regardless of the herbicide available, demonstration field testing is recommended to ensure their effectiveness in the Potomac River environment due to the hydrodynamic conditions. The Corps will continue to work with the states, toward the development of a safe, controlled, herbicide testing program that would provide a better understanding of the effectiveness and environmental impacts of herbicide use.

Mechanical/Physical Controls

A mechanical/physical control technique is one that directly or indirectly interferes with the growth or spread of an aquatic plant through mechanical or physical manipulation of the plant or its habitat. Under this broad definition, a wide variety of techniques could be included such as: cutting and harvesting of aquatic plants; placement of bottom-covering material over aquatic plant-infested sediments; dredging aquatic plant-infested bottom sediments; mechanical agitation of bottom sediments to detach root material; confinement or collection of detached plant material; temporary reduction of water level to expose and kill root material within the sediments; and addition of light-shading material (dye) to the water. All of these techniques have been used with varying degrees of success around the world. Perhaps the most promising and practical methods available for use in the Potomac River include mechanical harvesting, bottom barriers, and dredging on a small scale. To date, the resource agencies and the affected states in the Potomac area have indicated a preference for mechanical/physical control measures.

Mechanical/physical controls are used in other Corps' programs but generally at a much smaller scale than herbicides. These controls are generally employed for two reasons: 1) due to unsatisfactory control from herbicides because of unfavorable flow and turbidity levels and 2) policy considerations founded on environmental concerns which preclude the use of herbicides. The Municipality of Metropolitan Seattle (METRO) for example has conducted an aquatic plant harvesting program for watermilfoil for five years as part of the Corps' program. Over a five year period, approximately 600 acres were controlled in lakes around the metropolitan Seattle area using two mechanical harvesters. METRO policy advises against the use of herbicides, however, if all other methods are not considered feasible, then endothall is the only chemical suggested for use. The New Orleans District of the Corps terminated use of mechanical harvesters in 1972 due to unsatisfactory control levels and now relies exclusively on herbicides in its program.

Biological Controls

Biological control refers to the use of living organisms to suppress the population of an undesirable plant species. It includes the augmentation of endemic enemies and the release of exotic natural enemies. Ideally, a bio-control agent is host specific, attacking only the target plant, and maintaining it below the problem level. The major categories of biological control include fish, insects, and micro-organisms. With the exception of hydrilla consuming grass carp which have used successfully to control SAV in closed lakes and ponds in this country for the last 20 years, the remaining methods are still in the research phase and have been untested in large scale field areas against hydrilla. Presently, the most successful biological control for hydrilla is grass carp, an exotic fish species, however, the fish is non-selective in its food preference, is wide ranging, and can tolerate relatively high salinities. Grass carp are best employed as hydrilla control agents in ponds, lakes, and other freshwater sites where they can be contained. At the present time, both the State of Maryland and the U.S. Fish and Wildlife Service are opposed to the introduction of grass carp in the Potomac River because of the potential impact on native SAV in the river and the Chesapeake Bay.

Grass carp were introduced in two of the region's lakes in 1984 for hyrilla control. In September, 1984 the Virginia Commission of Game and Inland Fisheries stocked 2,200 sterile grass carp in Burke Lake, a 218-acre hydrilla infested waterbody in Fairfax County. Results should be available after this growing season as to the effectiveness of this action. In Reston, Virginia, the local homeowner's association introduced about 325 grass carp at a rate of about 8 carp per acre in a small lake in July 1984. As in the case of Burke Lake, no results are available yet, however, the 1985 growing season should yield some pertinent information.

The effectiveness of grass carp is variable depending upon the stocking rates, water temperatures, water quality and level of plant infestation. At Lake Conway Florida, the Corps has been heavily involved in a large scale test to control hydrilla and other macrophytes. More than 8,000 grass carp were stocked at a rate of 3-5 per acre. In 18 months, hydrilla was reduced by about 90 percent.

STATUS OF CORPS EFFORTS

The development of an environmentally safe, acceptable, and cost-efficient program to manage and control hydrilla in the Potomac River is the primary goal of the Baltimore District's activities. The Corps' program consists of two ongoing elements to include identification of the action plan to meet the above goal, and the research and development to support the planning effort and actual control operations. Assuming the planning study identifies an environmentally acceptable and economical plan that non-Federal interests are willing to cost-share, a full scale operational program for the Potomac River could be initiated in 1986. Other areas within the Chesapeake Bay which may become affected in the future can be included in the Corps program based on a supplementary planning evaluation of those areas on an as needed basis. Costs for the planning and research and development program are fully Federally funded whereas costs for the operational program requires cost-sharing with a non-Federal entity. Cost-sharing for aquatic plant control under Department of the Army proposed legislation (H.R. 1557 and S.534) will require 50 percent non-Federal participation in the operational program.

Planning Studies

In response to the initial inquiries by the states and others for Corps assistance, the Baltimore District completed a reconnaissance level study in September, 1984. The study determined that during 1984, hydrilla existed in sufficient quantities along the Potomac River to constitute a known problem of economic importance, although the plant problems were still in their early stages and affected only a few areas. They were expected to spread to a much larger area in future years. The report determined that there was a Federal interest in aquatic plant control in the Potomac River based on a preliminary analysis of existing and projected hydrilla related problems and potential solutions. On that basis, the study concluded that further Federal involvement was warranted in conducting more detailed studies in the form of a State Design Memorandum (SDM) which would recommend a control program.

The SDM is now under preparation by the Baltimore District. The document, which will be accompanied by an Environmental Impact Statement (EIS), will evaluate the full range of control measures currently available including chemical, physical/mechanical, and biological means. The SDM represents the document upon which final decisions will be made on the part of potential non-Federal sponsers for entering into a joint Federal - non-Federal hydrilla control program. A draft cooperative agreement stipulating the willingness and responsibilities of the affected parties in participating in hydrilla control will be part of the SDM and, it is assumed, that the prospective non-Federal sponsers will indicate their intent to enter such an agreement based on the SDM findings. A draft SDM will be available for public review in November of this year. The final SDM is scheduled for completion in March 1986.

Based on progress to date, the report will likely contain recommendations for future control of hydrilla in high public use areas such as marinas and navigation access lanes. Therefore, control should be confined to relatively small areas leaving the larger contiguous areas of hydrilla which represent little conflict with water related uses largely unaffected by control operations. Given this management objective, which is wholly consistent with the goals of the respective states, the environmental impacts of the controls are expected to be minimal.

RESEARCH AND DEVELOPMENT

The Corps has initiated a comprehensive research and development program to support the formulation of an acceptable control plan and to increase our level of understanding regarding monoecious hydrilla in the Potomac River. These efforts should enhance future management decisions regarding hydrilla control in the region and will also have a bearing on aquatic plant control throughout the Chesapeake Bay. The program is being headed by the Aquatic Plant Research Program at the Corps of Engineers Waterways Experiment Station (WES) in Vicksburg, Mississippi under the general direction of the Baltimore District. WES has engaged the services of many nationally known experts from various Federal agencies, academic institutions, and private contractors to assist in this effort. The research and development program consists of the following major elements: a field demonstration testing program, related analytical laboratory studies, and aquatic plant surveys.

Field Demonstration Testing

A series of field demonstration tests were initiated during the Fall, 1984 in hydrilla infested areas along the Potomac River. The primary objectives of the tests, were to provide site-specific information regarding the costs, effectiveness, and impacts of some of the more promising control techniques available today.

1984 Field Testing

During October, 1984 a mechanical harvesting test was conducted at Belle Haven Marina, Virginia; Old Town Yacht Basin, Alexandria; and Broad Creek, Maryland. The mechanical harvester is a floating cutter/collection system that detaches plant material in its path up to a depth of 5 feet and temporarily holds the harvested plant material which is subsequently off-loaded for upland disposal. The tests demonstrated that harvesting in the Potomac River at selected marinas and in the open river is feasible. On the average, the mechanical harvester was able to clear 1/4-acre per hour depending upon the density of hydrilla biomass in the target area. It is estimated from these tests that a harvesting would cost approximately $600 per acre. Although plant fragmentation occurs due to harvesting operations, it is not felt that these operations would significantly contribute to the spread of hydrilla when conducted in relatively small control areas and using safe standard operational practices. No further testing of the mechanical harvesting is planned at this time.

In addition to mechanical harvesting, the Corp's placed barrier mats on the channel bottom at Swan Creek along the Maryland shore in 1984. Barrier mats include a broad range of materials that can control the growth of rooted aquatic plants by altering of the plant's environment through reduction of light, compressing and confining the plant tissue leading to a reducing chemical environment, and providing a physical barrier through which plants cannot penetrate. Barrier mats are most appropriate in small areas in an around boat slips due to their high cost ($3,000 - $4,000 per acre) and propensity to be impacted by environmental factors which reduce their effectiveness. In 1985, the matted areas will be monitored to determine their stability during the winter months, to measure associated sedimentation on top of them, and to measure the encroachment of the surrounding hydrilla canopy from adjacent unmatted areas.

As noted earlier, the Corps' proposal to conduct a limited field test in Virginia waters using the chemical herbicide diquat in 1984 was terminated due to objections by the State of Maryland and the Commonwealth of Virginia and owing to the fact that the testing was delayed late into the growing season, thus jeopardizing the Corps' objective of securing reliable test data. As will be noted later, further Corps' efforts to undertake similar testing in 1985 were also terminated.

1985 Field Testing

Field demonstration tests this year are planned to complement earlier efforts accomplished in 1984. The tests will involve further investigation of barrier mat materials, use of a diver assisted dredge, and the transplanting of native submersed aquatic vegetation to halt the spread of hydrilla.

Approximately one-half acre of dartek and a newly manufactured material called texel will be placed in two of the access lanes and numerous slips within the Old Town Yacht Basin in Alexandria, Virginia, during the week of 20 May 1984. This test will yield information regarding actual installation/maintenance procedures and the rate of installation/areal coverage relationships which are possible in a marina situation. Continued monitoring of this area as well as in the areas matted in 1984 will be accomplished during the entire 1985 growing season.

A diver operated dredge test is planned for June, 1985 at the Belle Haven Marina on the Virginia shore. The test will involve a prototype device consisting of a small scale suction dredge manually operated by a pair of divers. This method, which has been used in New York, Wisconsin, California, and in Canada is most appropriate in confined and obstacle-filled areas such as marinas and is being tested to secure engineering performance data in a typical Potomac River setting.

The Corps will also transplant native submersed aquatic vegetation to determine if they can successfully compete with hydrilla and prevent its spread. These tests will be conducted in six 6 meter by 3 meter plots at four separate locations along the Virginia and Maryland shoreline. Transplanting will be initiated in late May/early June followed by intensive monitoring of the success of the transplanting and the rate of hydrilla invasion in the plots over the entire growing season. The test is being coordinated with the U.S. Fish and Wildlife Service, U.S. Geological Survey, Virginia Institute of Marine Science, University of Maryland and states and Maryland and Virginia.

The Corps' proposal for conducting a carefully controlled small scale field demonstration test involving the chemical herbicide diquat during the 1985 growing season was developed by Corps' planners to address the issues regarding the effectiveness of diquat in controlling hydrilla and, most importantly, the herbicides fate and environmental persistence in the Potomac River. The field tests were to have involved the closely monitored and controlled application of diquat in three two-area plots in Virginia waters of the Potomac River. The tests were to be preceded by dye tests to determine flow patterns and other hydrodynamic conditions which could influence the dispersion of diquat during and subsequent to its application. Based on experience in many of the Corps' southern districts who have had a long history of aquatic weed problems, it was felt that herbicides were probably the most effective and least costly control option available. However, field experience also indicated that diquat is less effective in turbid waters than in clear waters and that the testing would provide information on the effectiveness of diquat. The testing was coordinated with Federal and state agencies, and Congressional and environmental interests. The concurrence of both Maryland and Virginia were requested and a series of staff level meetings were held to discuss the testing in detail. Each state declared their opposition to the testing, however, further indicated their continued support of our work in evaluating all control measures in the future. Based on the views of the states and others, the diquat testing will not be conducted at this time.

Laboratory Research

The major portion of the research and development program will be conducted in highly controlled experimental conditions utilizing both indoor and outdoor laboratory facilities. This type of research is essential so that the individual and interactive factors which affect the growth, reproduction, and spread of the monoecious form can be better understood. Most of the data available today are based on the southern dioecious variety and it is widely recognized among aquatic plant experts that these data cannot be readily extended to monoecious hydrilla. Therefore, the laboratory research set forth in the Corps' program will close the information gaps which now exist and in the long run improve the overall prediction capability regarding the spread and the control of monoecious hydrilla in the Potomac River and the Chesapeake Bay.

The laboratory studies are centered on investigations related to the following areas of concern: reproduction, growth characteristics, environmental tolerances, competition with other species, and use of hydrilla by waterfowl, fish and invertebrate species.

The reproduction studies will focus on the viability of hydrilla's numerous reproductive features including turions, tubers, and stem fragments. Related growth studies regarding such environmental factors as the effect of nutrients in the water column and sediment, variation in available light, and salinity are also key. Competition work in outdoor tanks at the University of Maryland's Center for Environmental and Estuarine Studies, Horn Point Environmental Laboratories will provide information regarding the long term distributional potential of hydrilla and to what extent it can outcompete selected native aquatic species which typify the river and Bay. Finally, the U.S. Fish and Wildlife is conducting limited laboratory and field studies to establish the true ecological value of hydrilla for wildlife present in the system.

In support of the District's hydrilla control program, WES is also involved in further laboratory research regarding the effectiveness of herbicides. This research will provide some herbicide related information in the absence of site-specific field data, although this testing would not be as site specific as actual field testing. Research includes the evaluation of conventional herbicide formulations in flowing water conditions simulated by laboratory flumes, a determination of the herbicide uptake characteristics of hydrilla, and minimum exposure time necessary to control the plant.

Surveys

The last element of the research and development program pertains to distributional surveys of the plant in the river. The purpose of this program is to obtain accurate field information on the distribution, density, and spread of hydrilla. These surveys will span the 1984-1986 growing season and provide successive years of data which can be correlated with the laboratory work to allow a complete assessment of the controlling factors which affect hydrilla growth. The work is being conducted largely by the U.S. Geological Survey which has studied SAV patterns in the Potomac River for years and the Northern Virginia Community College. The field data will be correlated with aerial photo information and entered into an integrated data base with mapping capability.

OPERATIONAL PROGRAM

Given an acceptable plan for management and control of hydrilla is reached between the Corps, the states, and the District of Columbia, actual management and control operations could begin during 1986. We believe that the most prudent approach to dealing with this inter-jurisdictional problem is a regional one involving all of the affected parties including the Corps, State of Maryland, Commonwealth of Virginia and District of Columbia. To accomplish this, we have formed a Potomac River Hydrilla Management Committee in conjunction with the Metropolitan Washington Council of Governments. This committee, which consists of representatives from the states, local jurisdictions and the National Park Service will be asked to participate in a joint Federal/non-Federal program and secure the necessary non-Federal funding to help finance control and management operations. The Federal/non-Federal partnership must be secured if future control of hydrilla is to be realized under the Corps' Aquatic Plant Program.

II. WASHINGTON, D.C. FLOOD PROTECTION

HISTORIC PROBLEMS

Flooding on the Potomac River at Washington, D.C. is affected by both the tidal flooding from the Chesapeake Bay and the flood flows on the Potomac River upstream from Washington, D.C.

Historic flood flows combined with high tide elevations which have caused the highest observed elevations on the Potomac River in Washington, D.C., occurred in June 1889, March 1936 and October 1942. The resulting water surface elevations on the Potomac River in Washington, D.C. from the combined effects of fluvial and tidal influence were about the same magnitude in June 1889 and March 1936. The combined fluvial and tidal influence of the October 1942 flood led to water surface elevations about 1/2 foot higher than in 1936 on the Potomac River.

The flooding in March 1936 led to the loss of two lives and an estimated $5,300,000 (1984 dollars) in damages in Washington, D.C. The observed Potomac River water surface elevation near Wisconsin Avenue was about 17.11 feet above low water datum (LWD) and downstream at Fort McNair, the elevation was about 11.31 feet LWD. The October 1942 flood with a crest stage about 1/2 foot higher than the 1936 flood led to damages of about $8,900,000 (1984 dollars) in Washington, D.C. The area flooded by the 1942 flood is shown on Figure 3. A large portion of the increase in damages over the 1936 flood resulted from the concentration of temporary buildings and other activities along the waterfront. However, the damages would have been much higher without the timely organization of emergency protection facilities which protected the downtown area from flooding (see Figure 3 - 1942 potential flood area).

Maximum water surface elevation of 15.41 feet above LWD on the Potomac river at Wisconsin Avenue was observed for the flood of June 1972. However, it should be noted that the Theodore Roosevelt Bridge built in the 1960's markedly affects the water surface elevations upstream from the bridge. The June 1972 flood elevation at Wisconsin Avenue would be about 1 foot lower without the Theodore Roosevelt Bridge in place.

Flood damage at the Anacostia levee portion of the project has in recent years been due to interior drainage problems. However, during the Agnes storm of 1972, the Anacostia levee prevented the flooding of the Naval Air Station by the backwater of the Potomac River. Other flood events, for which limited data are available occured in 1877, 1881, 1924 and 1937.

The area flooded by the October 1942 flood included East and West Potomac Park, areas on Maine Avenue, Ft. McNair, the Navy Yard, Anacostia Park, area North of Naval Air Station, Bolling Field, and approaches to Washington National Airport.

PROJECT AUTHORITY

The 1936 Flood Control Act, authorized the flood protection project for Washington, D.C. The Act states in part:

> "Washington, District of Columbia: Levees and grade raising to protect downtown portion of Washington, Arlington Experimental Farm, Bolling Field, and Anacostia Naval Air Station; plans in House Document Numbered 101, Seventy-third Congress, first session; estimated construction cost, $571,000; estimated cost of lands and damages, $16,000."

The plan consisted of:

(a) Levee from Lincoln Memorial to Washington Monument.
(b) Raising P Street SW.
(c) Floodgates on sewer outlets.
(d) Levee around Arlington farm and airport.
(e) Levee around Bolling Field and adjustments at naval air station.

LOCATION AND DESCRIPTION OF THE EXISTING IMPROVEMENTS

The existing project shown in Figure 4 provides flood protection to downtown Washington, D.C. and to the area in and around the Anacostia Naval Air Station. The Potomac Park levee protects Washington, D.C., from the flood waters of the Potomac River while the Anacostia levee protects the Anacostia Naval Air Station from flood waters of the Anacostia River and backwater effects of the Potomac River. The drainage area of the Anacostia River and the Potomac River above their confluence at the project sites are approximately 170 and 11,700 square miles, respectively.

The Washington, D.C. and Vicinity flood protection project is in two segments. One segment of the improvement is located at Constitution Gardens and is known as the Potomac Park levee, the other segment stretches along the left bank of the Anacostia River from a point 500 feet inside the bounds of Bolling Air Force Base along the riverfront of the Anacostia Naval Air Station (NAS) to a point where the U.S. Botanic Gardens extension abut the U.S. Naval Station Anacostia Annex (Anacostia NAS Annex) and is known as the Anacostia levee. The construction of the project was completed in 1940 at a cost of $332,000.

The Potomac Park segment of the project, as constructed, consisted of a levee supported by a retaining wall that paralleled the reflecting pool of the Lincoln Memorial. Positive closures were installed on large pipe lines that pass through the line of protection. A grade raising was authorized at P and Canal Streets as part of the project. Temporary earth and sandbag closures were indicated across 17th Street and across Constitution Avenue. The Potomac Park levee was designed with top of protection of 20.5 feet LWD. The Anacostia segment of the project, as constructed, consisted of a levee on the left Anacostia Riverbank the first 500 feet of which was on Bolling Field. The levee from the Bolling Field property proceeded 3,150 feet upstream along the shore front of the NAS to the edge of the NAS seaplane ramp. As the project was constructed, the ramp was closed with a wooden dam approximately 430 feet in length. An 850-foot long seawall, with two wooden closures, extended from the upstream edge of the seaplane ramp. A levee was keyed to the northeast end of the seawall and extended 4,420 feet upstream to a point beyond the bounds of the NAS. At this point the levee was interruped by high ground created when ramps were built for the South Capital Street bridge. Approximately 900 feet upstream from where the levee tied into the bridge ramps, the levee started again and continued for about 1,000 feet and then turned landward on National Park Service (NPS) and Architect of the Capitol (AOC) lands to high ground. The design height of the Anacostia levee was 16.26 feet LWD. Sluice gates and flap gates were placed on the riverward end of pipes through the line of protection and four pumping stations were included to pump interior drainage to the river in times of high water.

The project was designed to provide protection against a flood discharge of 700,000 cubic feet per second (cfs) on the Potomac River coincident with a high tide at the confluence with the Anacostia River. It was assumed that flows on the Anacostia River would have a negligible effect on the flood stage. At the time of project design, the flow corresponded to the flood having a .60 percent chance of being equaled or exceeded in any given year (i.e. 164-year flood).

There are two major damage centers for which the protective works were built. The two areas are downtown Washington, D.C. (protected by the Potomac Park levee) and the Anacostia Naval Air Station, a portion of the Bolling Field and the Botanic Garden Extension (protected by the Anacostia levee). The Potomac Park levee protects residences, commercial and Government facilities, while the Anacostia River levee protects barracks, aircraft hangers, shops, etc. plus military tenant facilities.

1946 PROJECT MODIFICATION

An excerpt from the 1946 Flood Control Act is quoted as follows:

> "The project for protection at Washington, District of Columbia, on Potomac River, authorized by the Act of June 22, 1936, is hereby modified substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 622, Seventy-ninth Congress, second session, at an estimated cost of $500,000."

From House Document No. 622, cited above the following was the Chief of Engineers recommendation:

> "(2) modification of the existing flood-control project for Washington, D.C., to eliminate the protective works for Arlington Experimental Farm and to provide for protection of the downtown area substantially as recommended by the District Engineer but modified (a) as may be found desirable by the Chief of Engineers to conform to future landscaping of the Mall after the removal of temporary buildings and (b) to provide a removable closure at Seventeenth Street in lieu of raising the

> grade of the street, the structure to be designed in consultation with the Director, National Park Service, and approved by the Commission of Fine Arts, at an estimated cost to the United States of $500,000 for construction and $5,000 annually for maintenance and operation;"

However, this work has not been accomplished.

1978 REEVALUATION

Under the authority of Section 12 of the Water Resources Development Act of 1974, a deauthorization review was made of the authorized but unconstructed improvements in July 1978. The review recommended that the unconstructed portions of the project remain authorized since they were economically justified, would provide a more reliable means of protecting the downtown area, would restore the design level of protection, and would require less commitment of personnel, equipment, and materials in the event of a flood.

TODAYS CONDITIONS

Based on preliminary data, the area that would be affected by an occurrence of the design flood, if the project did not function properly, is shown on Figure 4 (1985 - without closures, potential flood area). Important buildings in this area include:

Department of Commerce
Post Office Department
Internal Revenue Service
Department of Justice/FBI Building
National Archives
Federal Trade Commission
Department of Labor
National Museum of History and Technology
National Museum of Natural History
National Gallery of Art
District Building
U.S. Court House
Rayburn House Office Building
Space Computing Center
Employment Security Building
Public Library Administration Office
Department of Health, Education, and Welfare
Food and Drug Administration
Social Security Administration

Changing conditions such as new highway systems, the Metro construction, and private development, as well as changes in the Potomac River itself, including the Bloomington Dam completed in 1981, could have an impact on flood damage potential in the District of Columbia.

CURRENT PROJECT STATUS

Two temporary earth levees have been incorporated into the Potomac Park Flood Protection Works. The purpose of the levees is to close low areas of 17th Street and Constitution Avenue to maintain design protection (El. 20.5' L.W.D.) in conjunction with the existing permanent levee. Construction of these levees is to be performed in accordance with existing plans in the Flood Emergency Manual, Washington Metropolitan Area. In summary, the levees are raised in successive steps corresponding to the predicted river stage at the Wisconsin Avenue gage. These levees which would be constructed in the event of a flood threat and removed when the threat is over, will provide protection against the design discharge of 700,000 cubic feet per second.

Responsibility for construction of these levees lies with the National Park Service (NPS), National Capital Region. Due to esthetic considerations, the NPS does not stockpile areas of filldirt. Trucking of fill material is necessary. Officials of NPS have stated that if absolutely necessary borrow material could be excavated from nearby parkland. At their maximum, the levee at 17th Street would be 10 feet high and 441 feet long requiring 2,285 cubic yards of fill material. At Constitution Avenue the levee would be 1.5 feet high and 393 feet long, and require 175 cubic yards of fill material.

P Street and Canal Street Closures

A sandbag closure 1.5 feet high and 125 feet long using 1,580 sandbags is required across a driveway through the circumferential wall of Ft. McNair with a second closure across 2nd Street from the Ft. McNair wall to the wall of an apartment house. This function is the responsibility of the District of Columbia Government along with closing a large gate on an outfall conduit at the end of P Street.

In addition to the above mentioned agencies, certain responsibilities during flood emergencies rest with the Architect of the Capital, G.S.A., the Military District of Washington, the Navy and Air Force.

The Corps of Engineers has overall responsibility for flood emergency planning and coordination of activities to ensure the effective functioning of the project. An Operation and Maintenance manual is periodically updated and annual inspections of the project are made with the responsible agencies.

We have initiated a review of the project to determine the desirability of constructing the permanent closures to the project. We are concerned about the effectiveness of the temporary emergency measures for floods greater than the 1942 flood and the resulting damages to government facilities, priceless historical artifacts and art and the interruption of key government functions should those measures fail.

III. RIVER SAFETY AT LITTLE FALLS DAM

INTRODUCTION

The Little Falls Dam is located in the Potomac River between Virginia and Maryland and just west of Washington, DC. The 1400-foot-long dam is used to divert water from the Potomac River into the Little Falls pumping station which pumps waters to the Washington Aqueduct for treatment and distribution in the Washington, DC area. The old historic rubble dam located approximately 50 feet downstream of the Little Falls Dam is used to divert water into the Chesapeake and Ohio Canal. The dam is a historic landmark and cannot be removed.

CURRENT CONDITION

The design of the Little Falls Dam is such that a vertical roller forms below the dam. The vertical roller is a flow condition that occurs when the plunging jet of water which flows over the dam is deflected causing a turbulent reverse circulation. This aids in dissipating energy, thereby reducing velocities before entering the exit channel. The roller helps keep the water from scouring the riverbed and possibly causing damage under the dam. Between 1975 and 1985 a total of 17 people drowned in vicinity of the dam. The victims ignored warning signs and attempted to boat over the dam. Boats were caught in the vertical roller below the dam and submerged by the turbulent flow. In order to help eliminate the possibility of an accident similar to that which occurred on 5 May 1984, the Corps was requested to investigate methods to improve safety conditions at Little Falls Dam. Since the dam was built people have been made aware of the dangerous conditions. Warning signs and buoys were posted upstream and the dangerous conditions have been publicized.

CORRECTIVE ACTIONS

In order to warn of impending danger at the dam a warning sign was constructed on Snake Island in August 1984 and a larger buoy system was placed approximately 2,000 feet upstream of the dam on 28 February 1985. The Corps of Engineers has coordinated with the State of Maryland, Department of Natural Resources, who have increased their law enforcement efforts on the Potomac River. A series of meetings were held with public and private individuals and agencies concerned with safety on the Potomac River. Many of the views of those people were incorporated in our investigation.

Every effort possible has been made to educate and warn boaters of the danger at the dam. Since there are still people who do not heed the warnings, the Baltimore District was requested to investigate existing flow conditions at the dam and determine what would be required to eliminate the vertical roller just downstream of the dam. A 1:30-scale model which reproduced 240 feet of approach channel, a 30-foot section of the Little Falls Dam, and 240 feet of exit channel which included the old rubble dam was used to determine the following:

a. Flow conditions with existing prototype conditions.

b. Flow conditions with the end sill removed on the Little Falls Dam.

c. Flow conditions with the old rubble dam removed.

d. Modifications to the Little Falls Dam that would eliminate the vertical roller.

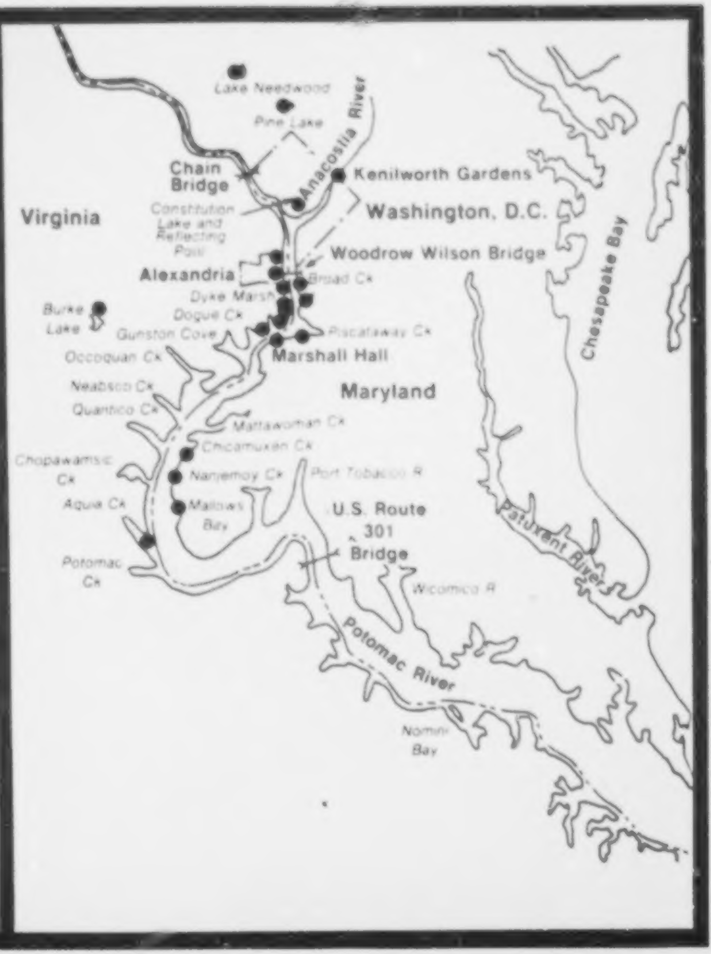
Tests were conducted with discharges over the dam up to 484,000 cfs, which is the maximum flood of record, and various tailwater elevations. Flow conditions did not improve when tests were conducted with the rubble dam removed or the end sill removed.

Two modifications to the dam were evaluated to solve the problem; one by placing 4- to 5-foot stone over the entire face of the dam and the other by pumping concrete into bags placed on the face of the dam. Both designs would be on a 1-vertical to 4-horizontal slope and both would eliminate the roller effect. The concrete-filled bag modification was selected since it does not involve rocks with jagged edges and would be safe in the event someone attempted to boat over the dam. This modification to the dam will cause a boater to remain on the river surface and not be pulled under by the vertical roller. The improvement is to protect boaters who ignore warnings of danger and not to encourage recreation at the dam.

As part of the detailed design, we are investigating the feasibility of incorporating fish passage provisions into the modification. With this action, we may be able to restore access to historical spawning areas for migrating fish in the Potomac River upstream of Little Falls Dam. This provision for fish passage, coupled with continued improvements in Potomac River water quality and specific actions by State and Federal fishery agencies to stock and monitor migratory species, will contribute to the goal of improving the Potomac River and the Chesapeake Bay at the same time as we accomplish the primary mission of public safety.

Plans and specifications for corrective measures are being prepared and are scheduled for completion on 28 June. Construction of the improvements is scheduled to begin in August and be completed in December. The estimated project cost is $3.4 million.

1984 Hydrilla Distribution


Lake Needwood
Pine Lake
Anacostia River
Chain Bridge
Kenilworth Gardens
Washington, D.C.
Virginia
Constitution Lake and Reflecting Pool
Woodrow Wilson Bridge
Alexandria
Broad Cx
Dyke Marsh
Burke Lake
Dogue Cx
Gunston Cove
Piscataway Cx
Marshall Hall
Chesapeake Bay
Occoquan Cx
Maryland
Neabsco Cx
Quantico Cx
Mattawoman Cx
Chicamuxen Cx
Chopawamsic Cx
Nanjemoy Cx
Port Tobacco R
Aquia Cx
Mallows Bay
U.S. Route 301 Bridge
Potomac Cx
Wicomico R
Patuxent River
Potomac River
Nomini Bay

Legend

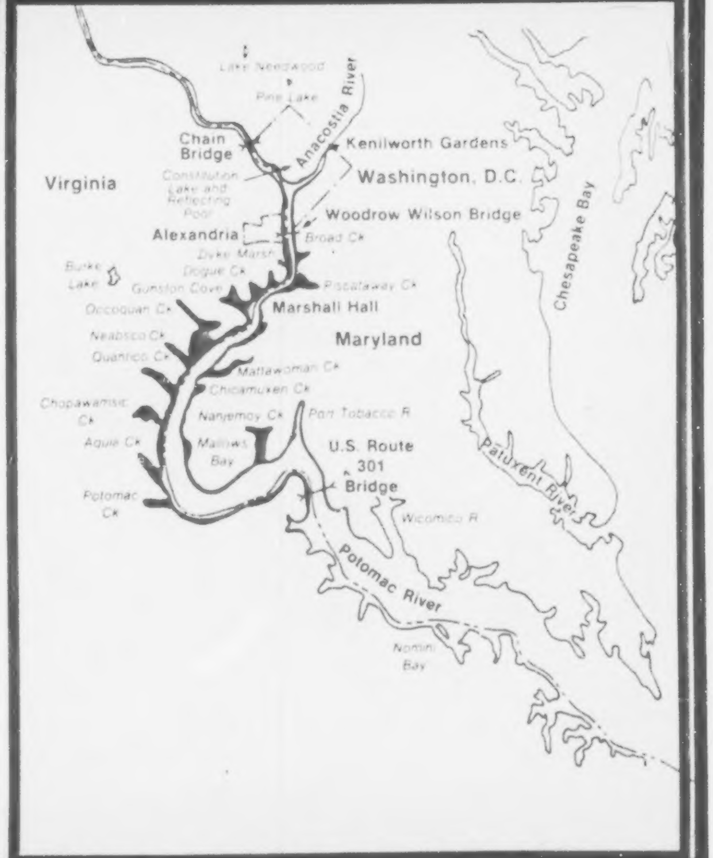
● Location of Hydrilla

1982 - 10 Acres

(Dyke Marsh Only)

1984 - 600 Acres

Potential Areas for Hydrilla Infestations by 1995

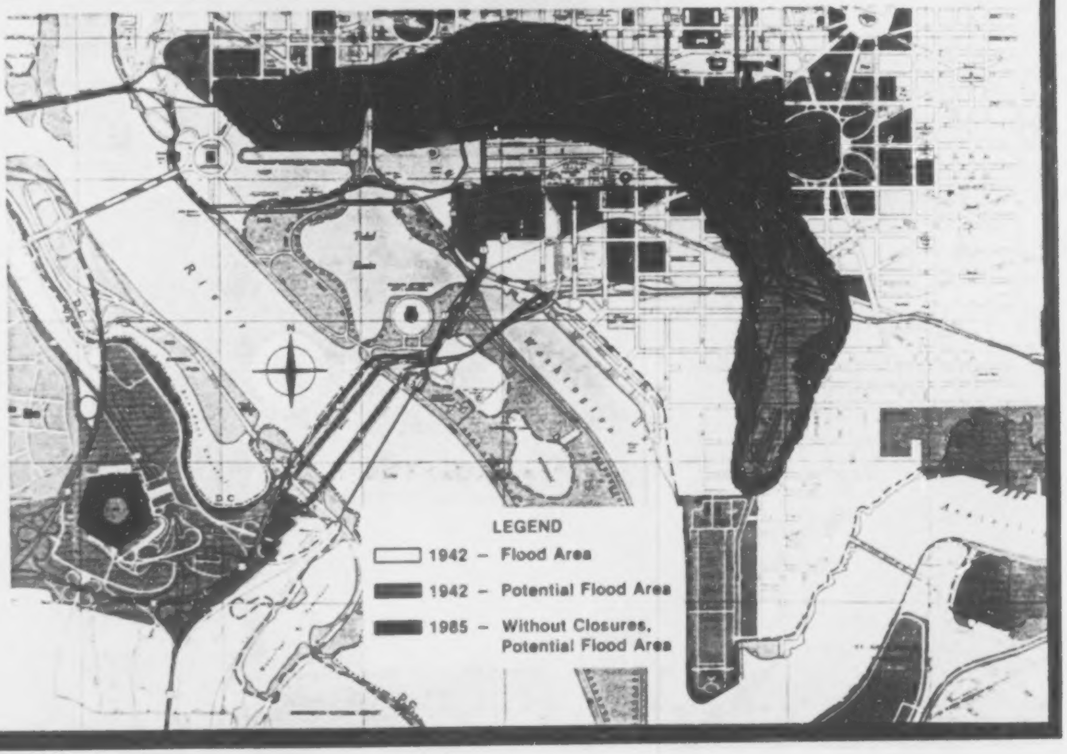

Lake Needwood
Pine Lake
Anacostia River
Chain Bridge
Kenilworth Gardens
Washington, D.C.
Virginia
Constitution Lake and Reflecting Pool
Woodrow Wilson Bridge
Alexandria
Broad Ck
Dyke Marsh
Dogue Ck
Burke Lake
Gunston Cove
Piscataway Ck
Marshall Hall
Occoquan Ck
Neabsco Ck
Quantico Ck
Maryland
Mattawoman Ck
Chicamuxen Ck
Chopawamsic Ck
Nanjemoy Ck
Port Tobacco R
Aquia Ck
Mallows Bay
U.S. Route 301 Bridge
Potomac Ck
Wicomico R
Potomac River
Nomini Bay
Patuxent River
Chesapeake Bay

Legend

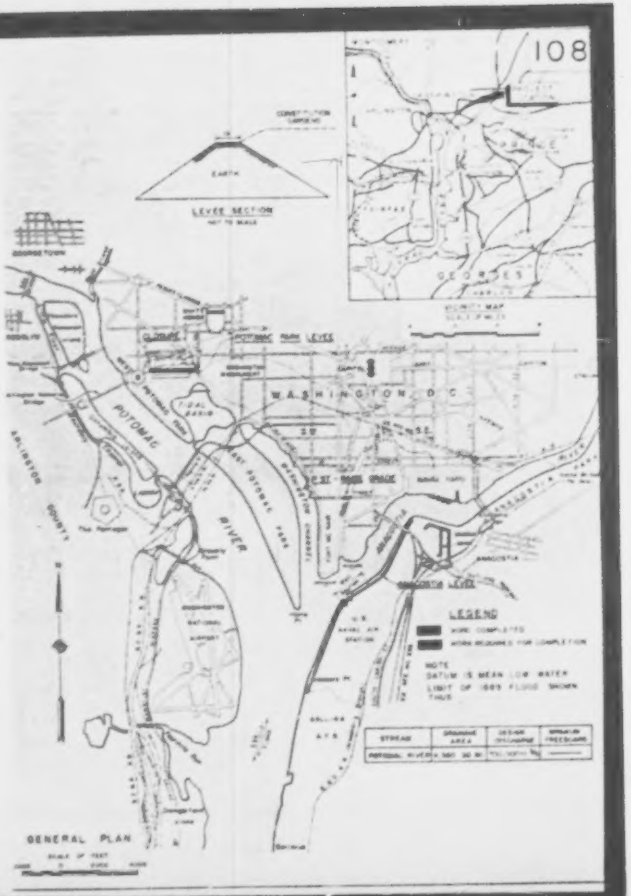
- ▬ Potential Location of Hydrilla

1995 - 34,000 Acres

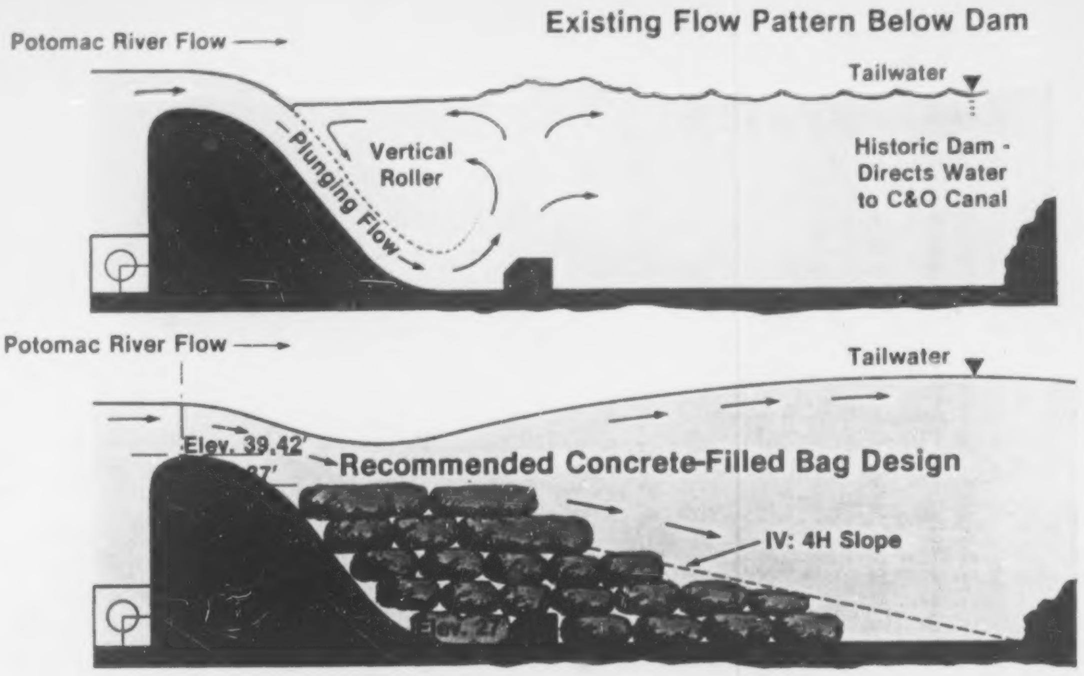
Washington, DC and Vicinity Local Protection Project


LEGEND
1942 – Flood Area
1942 – Potential Flood Area
1985 – Without Closures, Potential Flood Area
River
Washington
D.C.
N

Washington, DC and Vicinity Local Protection Project


108
LEVEE SECTION
EARTH
VICINITY MAP
GEORGES
GEORGETOWN
POTOMAC PARK LEVEE
WASHINGTON, D.C.
TIDAL BASIN
POTOMAC
RIVER
EAST POTOMAC PARK
WASHINGTON CHANNEL
ARLINGTON COUNTY
The Pentagon
WASHINGTON NATIONAL AIRPORT
U.S. NAVAL AIR STATION
ANACOSTIA
ANACOSTIA LEVEE
BOLLING A.F.B.
LEGEND
WORK COMPLETED
WORK REQUIRED FOR COMPLETION
NOTE
DATUM IS MEAN LOW WATER
LIMIT OF 1889 FLOOD SHOWN THUS
STREAM
DRAINAGE AREA
DESIGN DISCHARGE
POTOMAC RIVER
GENERAL PLAN
SCALE OF FEET

Little Falls Dam Modifications


Existing Flow Pattern Below Dam
Potomac River Flow →
Tailwater
Vertical Roller
Plunging Flow
Historic Dam - Directs Water to C&O Canal
Potomac River Flow →
Tailwater
Elev. 39.42'
37'
Recommended Concrete-Filled Bag Design
IV: 4H Slope
Elev. 27'

Mr. BARNES. Thank you, Colonel.

Let me ask Mr. Cole to come up to the witness table because we want to hear from Mr. Cole also, if you will pull another chair up. But before we hear from Mr. Cole, our next witness is Wallace White, chairman of the Water Resources Planning Board at the Council of Governments.

Mr. White, welcome to the subcommittee, sir.

STATEMENT OF WALLACE WHITE, CHAIRMAN, WATER RESOURCES PLANNING BOARD, METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS, ACCOMPANIED BY AUSTEN LIBRACH, STAFF DIRECTOR FOR WATER PROGRAMS

Mr. WHITE. Thank you, Mr. Chairman and members of the subcommittee, good afternoon. I have with me this afternoon Mr. Austen Librach, who is the staff director for water programs with the Council of Governments.

It is a pleasure to be here today representing the Metropolitan Washington Council of Governments to bring to you the latest news concerning the cleanup of our Nation's river, the Potomac.

Since a representative of the Council of Governments last testified before this committee, great strides have been made toward solving this region's most pressing water quality and water supply problems. This has been accomplished through good planning and a high level of cooperation among the area's local governments, the States of Maryland and Virginia, the District of Columbia, and the Federal Government.

Today, our locally operated sewage treatment plant facilities are meeting or exceeding some of the most stringent standards in the Nation for nutrients and oxygen-demanding materials, and we have seen substantial improvements in the water quality of the freshwater portion of the Potomac Estuary. Regional cooperation has virtually solved the disposal of sludge, the byproduct of stringent sewage treatment, and a cooperative water supply agreement insures an ample supply of drinking water to the region's inhabitants, even during severe drought periods.

The local governments in the metropolitan area, as represented by the Water Resources Planning Board [WRPB] are proud of their continuing contributions to these efforts. With our successful water pollution control operations at municipal treatment plants behind us, we are now moving ahead in the nonpoint source control field by implementing the recommendations developed from our nationwide urban runoff program project for urban stormwater control through best management practices, and to insure that we continue to track or progress in the Potomac cleanup effort, the local governments, through the WRPB, are participating in and coordinating a jointly supported and funded monitoring program.

Sampling agencies from Maryland, Virginia, the District of Columbia, Montgomery and Fairfax Counties, and the National Park Service are taking part in this effort. Rounding out the list of major local efforts is our continuing participation in the development and application of Potomac eutrophication model, a state-of-the-art water quality model used to guide the pollutant management decision process for the Potomac Estuary.

We believe that it is fair to say, with some degree of pride, that the Washington jurisdictions are setting an example for the Nation with a comprehensive effort to improve and maintain the Potomac River, a very beneficial resource for the community's use and enjoyment.

The Potomac is a natural system, however, and while we are certainly doing our part to minimize, in a cost-effective manner, our impact on the estuary, there are times when natural events may transpire to confound our best efforts. The summer of 1983 witnessed such a situation, when a major and unexpected algae bloom took place.

Our investigations show that direct discharges of nutrients from sewage treatment plants were not the cause. Instead, favorable weather conditions combined with unexpected nutrient releases from sediment in the river bottom stimulated this event. While some of the river bottom nutrients may have come from previous sewage plant discharges, we believe it is also likely that a major component originated from upstream nonpoint sources, particularly agricultural runoff, and upbasin treatment plants which are years behind the metropolitan area in their level of pollutant removal.

These potential sources, along with other intriguing possibilities such as the role acid rain may have played in the event, are a continuing reminder that our work is not yet complete. More research is still needed to better understand to manage, protect, preserve, and enhance this vital resource.

The story of the 1983 algae bloom is a fascinating one, and unraveling this unexpected and unusual event required an unparalleled degree of cooperation among the local governments, the adjoining States, EPA, and five eminent scientists from around the Nation called in to investigate.

Based on their analysis of the monitoring data and modeling results and related research, the expert panel independently reached a determination on the principal causes of the bloom and identified alternative goals and strategies designed to address future eutrophication problems in the river.

I will briefly review the panel's findings concerning the causes of the 1983 bloom and its recommended alternative Potomac eutrophication goals and management strategies.

First, the panel determined that up until the end of July 1983, the very favorable weather and flow conditions, in combination with available nutrients in the water, led to the initial development of the bloom.

Second, between August and October, continued favorable weather conditions in combination with phosphorus releases from river bottom intensified and maintained algae concentrations beyond their initial stage. The magnitude of phosphorus released from the sediments back into the water was unanticipated and fostered the development of a bloom that was two to three times greater than would have otherwise occurred.

Third, the panel ruled out numerous other factors as causes. Notable among hypotheses rejected by the panel was that sewage plants had malfunctioned, that inadequate treatment caused the bloom, and that a Virginia embayment called Gunston Cove had seeded the bloom.

Based upon their excellent detective work which unraveled the 1983 bloom, the panel offered alternative goals and courses of action for the regulators to follow, with maintenance of the existing control program underlying all options. Mr. Chairman, the local jurisdictions, in partnership with the Federal and State regulatory bodies, are now in the process of carrying out the mandate of the algae bloom panel.

What stands out to us as local jurisdictions in the panel report is that the control efforts we have taken and are continuing to take are beneficial to the estuary's water quality. While we must be vigilant in maintaining our existing program, there is substantial cause for optimism, because, for perhaps the first time in 20 years, municipal effluent was not the direct cause of the estuary water quality problems.

It is therefore clear that we must now focus elsewhere, particularly on nonpoint sources and upper basin loads if we wish to ensure further progress and continue to decrease the frequency of blooms. The Washington region has contributed its share to improving Potomac River quality; let others now join us to complete the effort. An equitable sharing throughout the Potomac Basin of the burden of protecting this great body of water is the logical conclusion to be drawn from the expert's scientific report.

A number of important decisions were delayed pending completion of the expert panel deliberations, with the most notable among them the expansion and upgrading of the Blue Plains Wastewater Treatment Facility, the region's largest plant which serves nearly 2 million of the metropolitan area's residents. The continued growth and prosperity of the Washington area depends on implementation of this project, and it is clear, from a multitude of studies and analyses, including the expert panel report, that expansion of the facility at existing effluent levels—which are 50 to 75 percent lower than occurred in 1983—is completely consistent with maintenance of good water quality in the estuary.

Mr. Chairman, I would now like to turn to possible amendments to the Clean Water Act currently pending in the Congress. I would like to bring to your attention that our efforts for a clean Potomac may be directly affected by several of the proposed modifications in the reauthorization of the Clean Water Act, both in a positive manner and potentially in an adverse manner as well.

As you know, both the House and Senate are working on separate bills at this time. Pending before the House is H.R. 8, which is now in markup. A somewhat similar bill has been reported out of the Senate Environment and Public Works Committee, S. 1128. We understand that passage of reauthorization legislation this year is likely after a House-Senate conference committee works out the differences between the bills.

We would urge your support for three modifications that are currently reflected in one or both versions of these bills.

Nonpoint sources cause a major percentage of nutrient loadings in the Potomac. Both the House and Senate bills would establish a nonpoint source pollution management requirement. It would require each State to develop and have implemented policies and programs designed to minimize the amounts of pollutants from sources such as urban stormwater runoff, mine drainage, runoff from agricultural land, and the like. It is envisioned that the State program would build on work already accomplished and involve regional and local units wherever possible. We strongly support this requirement.

Both bills provide for a statutory base and funding for the Chesapeake Bay program. We commend you, Mr. Chairman, and your colleagues from Maryland and Virginia for having this vital program included in these amendments to the Clean Water Act.

The House bill proposes two amendments that would increase the capacity or local governments and their regional agencies to update and upgrade their areawide water quality management plans. H.R. 8 authorizes funding for 2 more years of such management planning under section 208 of the act. COG/WRPB is the designated section 208 agency in the Washington area and would be eligible to receive funds to integrate all the new data and analysis currently available into the region's existing section 208 plan.

Finally, there is a provision in the Senate's version of the clean water amendments of 1985 commonly referred to as "antibacksliding" which gives us a great deal of concern, and we would urge that the House oppose its inclusion in the final conference bill.

Section 114 of the Senate bill provides, in essence, that a renewed or reissued discharge permit shall not contain less stringent effluent limitations than the previous permit, even if the State or EPA subsequently issues effluent guidelines that are less stringent than those in the original permit. We believe this would be bad policy.

States, with EPA approval, must periodically establish effluent guidelines which will attain EPA-approved water quality standards. The act requires States to examine continuously both its standards and effluent guidelines to reflect new data and changing conditions. EPA would not approve a less stringent standard or guideline if such action would jeopardize the State's meeting the goals of the act. The permit review mechanism should be free to reflect the changes brought about by new data and analysis.

Mr. Chairman, this concludes my remarks on behalf of the Metropolitan Washington Council of Governments. Thank you for this opportunity to share our news and ideas with you and your committee.

[The prepared statement with attachments of Mr. White follow:]

Metropolitan Washington Council of Governments
Water Resources Planning Board

Testimony to the Subcommittee on Government Operations and Metropolitan Affairs

by Wallace White, Chairman
Water Resources Planning Board

May 29, 1985

Good afternoon Mr. Chairman and members of the SubCommittee. It is a pleasure to be here today representing the Metropolitan Washington Council of Governments to bring to you the latest news concerning the cleanup of the "nation's river," the Potomac. Since a representative of the Council of Governments last testified before this Committee, great strides have been made toward solving this region's most pressing water quality and water supply problems, through good planning and as a result of a high level of cooperation among the area's local governments, the states of Maryland and Virginia, the District of Columbia, and the federal government. Locally operated sewage treatment plant facilities are meeting or exceeding some of the most stringent standards in the nation for nutrients and oxygen-demanding materials, and there have been substantial, quantifiable improvements in the water quality of the freshwater portion of the Potomac Estuary resulting from these expenditures. Regional cooperation has virtually solved the disposal of the by-product of stringent sewage treatment - sludge - and a cooperative water supply agreement insures an ample supply of drinking water to the region's inhabitants, even during severe drought periods.

The local governments in the metropolitan area, as represented by the Water Resources Planning Board (the "WRPB"), the Washington area "208" agency, are proud of their continuing contributions to these efforts. Beyond the expenditures for water pollution control operations at municipal treatment plants of about $100 million per year, we are moving ahead in the nonpoint source control field as well, by implementing the recommendations developed from our Nationwide Urban Runoff Program project for urban stormwater control through best management practices. And to insure that we continue to track our progress in the Potomac cleanup effort, the local governments, through the WRPB, are participating and coordinating a jointly supported and funded monitoring program involving sampling agencies from Maryland, Virginia, the District of Columbia, Montgomery and Fairfax Counties, and additional support from the National Park Service. Rounding out the list of major local efforts is our continuing participation in the development and application of the Potomac Eutrophication Model, a state-of-the-art water quality model used to guide the pollutant management decision process for the Potomac estuary.

We believe that it is fair to say, with some degree of pride, that the Washington jurisdictions are setting an example for the nation with a comprehensive effort to improve and maintain a very beneficial resource for the community's use and enjoyment.

The Potomac is a natural system, however, and while we are certainly doing our part to minimize, in a cost-effective manner, our impact on the estuary, there are times when natural events may transpire to confound our best efforts. The summer of 1983 witnessed such a situation, when a major eutrophication event -- an algae bloom -- took place. However, direct discharges of nutrients from sewage treatment plants were not the cause. Instead, favorable weather conditions combined with unexpected nutrient releases from the river bottom - the sediment layer - to spur this event. While some of the river bottom nutrients may have come from historical sewage plant discharges, we believe it is also likely that a major component originated from upstream nonpoint sources, particularly agricultural runoff, and upbasin treatment plants which are years behind the metropolitan area in their level of pollutant removal. These realities, along with other intriguing possibilities such as the possible impact of acid rain are a continuing reminder that our work is not yet complete. More research is still needed to better understand and help us better manage, protect, preserve, and enhance this vital resource.

The story of the 1983 algae bloom is a fascinating one, and unraveling this unexpected and unusual event required an unparalleled degree of cooperation among the local governments, the adjoining states, EPA, and five eminent scientists from around the nation called in to investigate this question. Before addressing further the local perspective on where we should go in the future, I am going to step back and review for the Committee the details of the 1983 Algae Bloom Study and Expert Panel Report.

Background and Context of the 1983 Algae Bloom Study

Historically infestations of floating mats of algae have periodically affected the upper Potomac estuary. At times, especially during summer periods of relatively low freshwater inflow, mats of decaying algae cells have affected the Potomac from the District of Columbia as far down as Quantico Creek. However, as a result of wastewater treatment improvements during the late 1970's and early 1980's, phosphorus concentrations necessary for algae production were significantly reduced, dissolved oxygen levels increased, and there were no reported algae bloom conditions. It appeared that the upper estuary was responding favorably to high levels of phosphorus removal, improved nitrogen control (through nitrification), and reductions in oxygen demanding substances in wastewater effluents.

In the summer of 1982, recorded average chlorophyll-a concentrations (chlorophyll-a is a pigment in algae measured to quantify algae concentrations) were below 20 micrograms per liter (ug/l). However, in the summer of 1983, especially in August and September, algae bloom conditions with floating surface mats reappeared. Massive chlorophyll-a concentrations of 200-300 ug/l emerged in the area from Piscataway Creek to Quantico. The bloom did not dissipate until November, 1983. The return of massive algae growths of this magnitude was unexpected and raised concerns about the efficacy of regional investments of about $1 billion in wastewater treatment improvements which have been made to enhance Potomac Estuary water quality.

As a result and in response to the bloom, the 1983 Algae Bloom Study was undertaken to examine why the bloom occurred and determine what could be done to avoid or reduce the frequency of such occurrences in the future. At the time the study was undertaken, it was uncertain as to whether the 1983 "bloom" would yet again be categorized as one in which sewage treatment was deemed inadequate and caused the bloom.

The Algae study was conducted by an independent five-member "Expert Panel" selected by EPA Region III and the Maryland, Virginia, and District of Columbia state water quality regulatory agencies. Each panelist was a recognized expert in scientific and environmental engineering fields related to algae and eutrophication dynamics. Members included Dr. Robert V. Thomann of Manhattan College, a professor and practicing environmental engineer with extensive experience in estuarine management studies and development of mathematical water quality models; Dr. Scott Nixon, from the University of Rhode Island, internationally recognized for his work in microcosm studies to evaluate algae blooms; Dr. Jay Taft, Harvard University, a preeminent estuarine phytoplankton ecologist with extensive experience with the Potomac Estuary, Chesapeake Bay and numerous other Bay systems; Dr. Hans Paerl, of the University of North Carolina, a photoplankton physiologist with extensive experience in evaluating the response of blue green algae to environmental changes. Of note is Dr. Paerl's research on algae blooms in the Neuse and Chowan estuaries of North Carolina. The final panelist, Dr. Norbert Jaworski, is Director of EPA's Environmental Research Laboratory in Duluth, Minn. Dr. Jaworski has 20 years of experience with Potomac estuary water quality issues.

Technical support to the Panel in water quality monitoring and modeling and associated data management work was provided by staff from the Metropolitan Washington Council of Governments (COG). COG was assisted by staff from the Interstate Commission on the Potomac River Basin (ICPRB) and the firm of HydroQual, Inc. Special laboratory studies were also conducted by the Academy of Natural Sciences of Philadelphia, Pennsylvania.

The study contract was administered by the Potomac Strategy State/EPA Management Committee comprised of members from the Maryland Office of Environmental Programs, Virginia State Water Control Board, District of Columbia Department of Consumer and Regulatory Affairs and EPA Region III. COG and the ICPRB were also non-voting participants on this committee. Funding to support the Panel's efforts and COG's staff support activities was provided from these agencies with matching funds from MWCOG's member local governments.

The Expert Panel conducted its analysis of the bloom during March-December, 1984. During that period the Panel identified and evaluated fifteen hypotheses as possible causes of the bloom. The hypotheses considered were identified by the Panel after receiving public input.

The hypotheses fell into five general categories of investigations. These covered the introduction of "pulse" nutrient inputs to the Potomac mainstem; physical, climatological and hydrological factors favorable to bloom formations; biological factors favoring nuisance forms of algae growth; nutrient inputs from river bottom sediments; and inputs related to wastewater treatment plants. A summary of the fifteen hypotheses and their assessment by the Panel is shown in Table 1. Additional detail is also found below under "Findings."

As part of their investigations, the Panel reviewed available historical and 1983 water quality and pollutant loading data to the Potomac mainstem and individual embayments. They also reviewed results from about 50 water quality simulation runs conducted with the Potomac Eutrophication Model.

In support of the Panel's efforts, COG prepared a report which assembled all available 1983 water quality, hydrological and climatological data for their use and analysis. COG also conducted and presented results of the Potomac Eutrophication computer simulation model runs the Panel requested. HydroQual, Inc., a consultant to COG, investigated several of the fifteen hypotheses for the Panel. The Panel also requested and reviewed results from bottom sediment core samples collected and analyzed by the Academy of Natural Sciences of Philadelphia.

Some of the water quality data utilized by the Panel is shown in Figure 1. This figure illustrates the observed algae concentrations over the mid-August to mid-September, 1983 period in terms of micrograms per liter chlorophyll-a, a measure used by biologists to quantify how much algae was in the river. As is seen, the area of greatest concentration was between Piscataway and Quantico, some 20 to 40 miles below Washington, D.C., and in an embayment on the Virginia shore called Gunston Cove. Information such as this was collected under the coordinated monitoring program and synthesized by COG into the data report on behalf of the Panel of Experts.

The Expert Panel met periodically with a technical sub-committee of the State/EPA Management Committee to discuss preliminary results of their analysis and gain further guidance concerning questions which the Committee wished to be addressed under the study.

Based on their analysis of the monitoring data and modeling results and related research, the Panel independently reached a determination on the principal causes of the bloom and identified alternative goals and strategies designed to address future eutrophication problems in the river. The Panel's findings concerning the causes of the 1983 Bloom and recommended alternative Potomac eutrophication goals and management strategies are presented in their March 14, 1985 Final Report to the Potomac Strategy State/EPA Management Committee entitled The 1983 Algal Bloom in the Potomac Estuary.

Findings on the Causes of the 1983 Algae Bloom

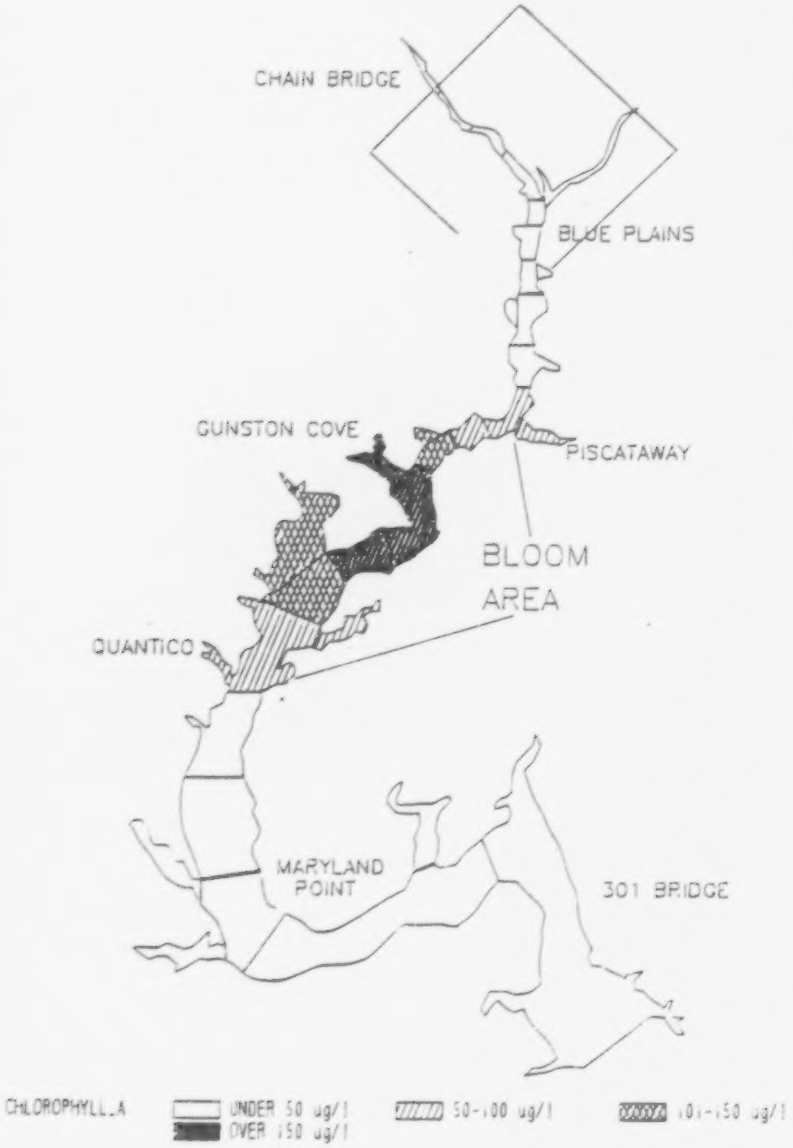
The Panel determined that up until the end of July, 1983 the prevailing weather and flow conditions, in combination with available nutrients in the water column led to the development of the bloom. Between August and October, phosphorus releases from river bottom sediments in the bloom area intensified and maintained chlorophyll-a concentrations beyond their initial stage of 100 micrograms per liter (ug/l) to levels occasionally exceeding 300 ug/l. The magnitude of phosphorus flux rates from the sediments back into the water column was unanticipated and fostered the development of a bloom that was 2-3 times greater than would have otherwise occurred. High pH levels (approximating 9.0 and above) in overlying waters were suspected by

TABLE 1
SUMMARY OF EXPERT PANEL CONCLUSIONS
CONCERNING HYPOTHESES ON THE CAUSES
OF THE 1983 POTOMAC ALGAE BLOOM
INTENSIFICATION

HYPOTHESES	EXPERT PANEL ASSESSMENT		
	Major Cause	Contributing Factor	Not a Cause (Hypothesis rejected)
o Mainstem Nutrient Pulse Hypotheses			
-Malfunctioning wastewater treatment plants			x
-Pulse from massive sediment release			x
-Pulse from combined sewer overflows			x
-Spring runoff pulse released in summer			x
o Climatological, Hydrological, and Transport Hypotheses			
-Lack of turbulence (water column stability)			x
-Joint coincidence of sunshine, temperature, high clarity, and low turbulence		x	
-Lack of suspended sediment from upper basin contributed to transport of dissolved phosphorus to bloom and		x	
-Stratification and lower estuary circulation enhanced bloom in area of salinity intrusion		x	
o Biologically Specific Hypotheses			
-Low in organic carbon formed Microcystis scumming behavior and led to its dominance			x
-Normal predators were not present			x
o Sediment-Related Hypothesis			
-High pH resulted in "positive feedback" aerobic release of sediment phosphorus	x		
o Treatment Related Hypotheses			
-Treatment practices in Gunston Cove acted as an inoculum for mainstem			x
-Excess phosphorus w/o nitrogen removal resulted in downstream transport of nitrogen			x
-Nothing unusual took place in 1983, bloom was expected			x
-NPDES permits not fully implemented			x

FIGURE 1

AVERAGE CHLOROPHYLL A CONCENTRATIONS
AUGUST 15 TO SEPTEMBER 15
POTOMAC ESTUARY 1983


CHAIN BRIDGE
BLUE PLAINS
GUNSTON COVE
PISCATAWAY
BLOOM AREA
QUANTICO
MARYLAND POINT
301 BRIDGE
CHLOROPHYLL_A
UNDER 50 ug/l
50-100 ug/l
101-150 ug/l
OVER 150 ug/l

the Panel as the principal driving force which stimulated increased phosphorus release from bottom sediments and fed intensification of the bloom beyond its initial stage.

The Panel concluded that high pH appeared to be a consequence of biochemical transformations in the water column that resulted from increased rates of algae production (photosynthesis). Between August and October, the bloom appeared to be sustained and intensified through internal recycling between algae production, high pH and the release of nutrients from the bottom sediments which stimulated further algae growth.

The Panel further suggested that the high pH levels may have also been a partial consequence of relatively low buffering capacity in the estuary during 1983. The estuary's ability to buffer against alkaline pH shifts apparently has declined since the late 1970's for reasons that are not entirely clear. The Panel surmised that some, but certainly not all of the estuary's reduced buffering capacity may be attributed to the implementation of advanced wastewater treatment processes which changed acid/alkalinity characteristics of wastewater plant effluents. It has been further speculated, although certainly not proven, that the low buffering capacity in the estuary was due to the high spring runoff which occurred in 1983, and that acid rain may have been a contributing factor to the lower buffering capacity of the spring freshet.

The Role of Weather Conditions

The Panel concluded that weather conditions were highly favorable for algae growth in the upper Potomac estuary during July-September, 1983. River flows were 30-80% of normal; percent sunshine (70-85%) and temperatures generally higher than in previous years; and wind speed (6.5 mph) significantly lower. The Panel concluded that the joint coincidence of these conditions contributed to the onset of the bloom but did not appear to be its sole cause.

The mid-summer to early-fall weather conditions which occurred did provide for relative stability in the water column which favored the growth of Microcystis, a bright green buoyant algae, over other algae types. The dominance of Microcystis and its tendency to form a scum or mat at or near the surface under such conditions made it a highly visible and particularly noxious intrusion which precluded opportunities for safe water contact recreation and also posed potential adverse consequences for aquatic life.

The Role of Point Sources

The Panel concluded that under the prevailing flow and weather conditions through July, 1983 nutrient loadings available in the river from normal base flow, wastewater discharges, nonpoint and atmospheric sources were sufficient, in combination, to support the initial stages of the bloom. The intensification of algae production during August-October was not directly attributed to treatment plant phosphorus loadings nor to "pulse" loadings from any unreported plant malfunction or occasional storm-induced combined sewer overflow discharge.

The Panel noted that, even if the wastewater treatment plants had been operating at their "final" NPDES permit limits, the bloom still would have occurred due to the nutrients supplied from the bottom sediment source. (The final NPDES limits for phosphorus control were nearly achieved in the summer of 1983 and have been generally implemented at area wastewater facilities since that time. Essentially the Panel concluded that the small difference between 1983 treatment levels and NPDES limits was minor and even if NPDES limits had been implemented in 1983, the bloom would not have been prevented or mitigated.) The Panel also observed that implementation of nitrification at some of the plants had lowered the alkalinity in plant effluents, especially at Blue Plains. This may have had the unanticipated effect of somewhat reducing the estuary's capacity as a buffer against high pH levels. The Panel concluded, however that such changes in effluent could only partially explain reductions in estuary buffering capacity which made it easier for the high pH to occur, and natural factors may have been the dominant cause of the low buffering capacity. More research was suggested by the Panel to examine the buffering capacity issue.

The Role of Nonpoint Sources

The Panel examined the total amount of phosphorus and nitrogen in the upper estuary for the summer, 1983 and concluded the upper Potomac basin contributions (of baseflow, nonpoint, and point source discharges) from above Chain Bridge could not directly account for the blooms' intensification beyond its initial stage. The Panel also initiated review of the possibility that nonpoint loadings carried into the estuary during high flow periods of winter-spring runoff might serve as the source of phosphorus released from the sediments the following summer. It found that total phosphorus delivered by the upstream Potomac (above Chain Bridge) to the estuary during January-May, 1983 was 30-40 times the amount of phosphorus observed in the river over the summer. However, the Panel also observed that the amount of phosphorus within the bottom sediments appeared to be so large relative to the amount in the water column that even a very small fractional loss could have yielded the "excess" phosphorus which intensified the bloom. Because of this they decided to focus their further analysis on identifying the mechanisms responsible for mobilizing phosphorus from the sediments as being of more immediate concern than its ultimate source. While not establishing this source directly, the Panel's report implied that nutrients entrained in the bottom sediments originated from some combination of Potomac baseflows, spring runoff and point source discharges. However, as noted, the Panel's study did not quantify or isolate these loadings by their origins. Insufficient data was available for the purpose. Also the models used in the overall analysis lacked the sediment chemistry relationships needed to effectively represent and simulate the long-term accumulation, fate, and release of phosphorus and nitrogen loads from bottom sediments.

Other Contributing Factors to the 1983 Bloom

Other factors which may have contributed, in some lesser degree, to the bloom conditions included downstream estuarine circulation patterns which may have increased nutrient supplies transported to the bloom area, and disturbances of bottom sediments by aquatic organisms which could have further contributed to sediment nutrient releases. Another contributing factor cited was reduced settling of nutrients near the treatment plant discharges resulting from effluent and river water low in suspended solids.

One factor ruled out by the Panel as a contributing factor was the hypothesis that a tidal embayment on the Virginia shore, Gunston Cove, seeded the bloom, because the bloom was first noted in that portion of the river. The Panel concluded that the mainstem Potomac bloom was only marginally affected by the conditions which appeared somewhat earlier in Gunston Cove. The mainstem bloom would have progressed with or without the Cove source. In general, with the exception of the Cove's Pohick arm, the Panel's analysis revealed that water quality conditions in the Cove are far more influenced by conditions in the Potomac than the converse.

Expert Panel Recommendations

The Panel provided decision-makers with a range of options and eutrophication goals, and qualitatively associated a different level of risk of a repeat of 1983 conditions with each one. The Panel recognized that the regulatory agencies would be left to balance the benefits and costs associated with each possible course of action in order to make a decision.

In addition, the Panel recommended immediate implementation of a so-called "Overall Recommendation" that outlined specific research activities designed to strengthen certain recommendations. The centerpiece of the "Overall Recommendation" was a study to determine if some relatively simple control measure might be feasible for use in preventing the occurrence of the sediment phosphorus process hypothesized as the cause of the 1983 algae bloom's intensification. Figure 2 presents a summary flowchart of the Expert Panel's recommendations.

Alternative Potomac Estuary Eutrophication Goals

As is seen in Figure 2, in addition to carrying out the "Overall Recommendation", the Panel offered two alternative eutrophication goals, for consideration by the regulatory agencies.

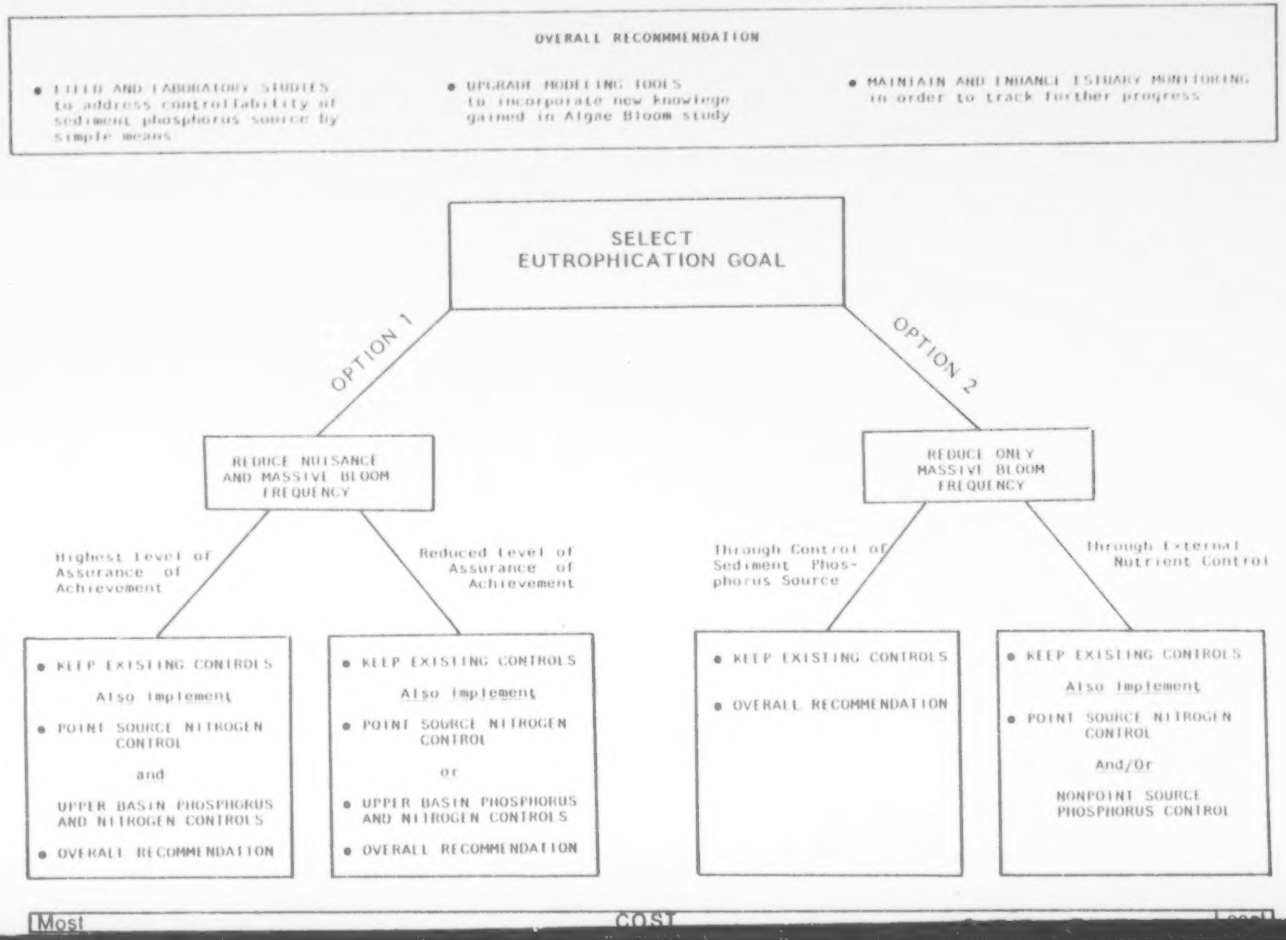
Goal #1 consists of reducing the frequency of occurrence of both nuisance blooms and massive blooms. In essence this goal advocates attempting to prevent all algae blooms through maximum implementation of nutrient controls (point or nonpoint or origin). With reference to 1983, it attempts to achieve not only elimination of the intensification phase (chlorophyll-a at 250-300 ug/l) of the bloom but also to reduce the frequency that the first phase occurs (chlorophyll-a levels at or below 100 ug/l).

Goal #2 consists of reducing the frequency of occurrence of only massive blooms, thereby tolerating algae blooms considered only at a "nuisance" level. In essence adoption of Goal #2 argues in favor of controls to prevent the intensification phase of the 1983 type bloom.

To implement the eutrophication goals, the Panel offered a series of measures which if adopted would help, with varying degrees of assurance and

FIGURE 2

ALGAE BLOOM EXPERT PANEL RECOMMENDATIONS


OVERALL RECONMMENDATION
• FIELD AND LABORATORY STUDIES to address controllability of sediment phosphorus source by simple means
• UPGRADE MODELING TOOLS to incorporate new knowlege gained in Algae Bloom study
• MAINTAIN AND ENHANCE ESTUARY MONITORING in order to track further progress
SELECT EUTROPHICATION GOAL
OPTION 1
OPTION 2
REDUCE NUISANCE AND MASSIVE BLOOM FREQUENCY
REDUCE ONLY MASSIVE BLOOM FREQUENCY
Highest Level of Assurance of Achievement
Reduced Level of Assurance of Achievement
Through Control of Sediment Phosphorus Source
Through External Nutrient Control
• KEEP EXISTING CONTROLS
Also Implement
• POINT SOURCE NITROGEN CONTROL
and
UPPER BASIN PHOSPHORUS AND NITROGEN CONTROLS
• OVERALL RECOMMENDATION
• KEEP EXISTING CONTROLS
Also Implement
• POINT SOURCE NITROGEN CONTROL
or
• UPPER BASIN PHOSPHORUS AND NITROGEN CONTROLS
• OVERALL RECOMMENDATION
• KEEP EXISTING CONTROLS
• OVERALL RECOMMENDATION
• KEEP EXISTING CONTROLS
Also Implement
• POINT SOURCE NITROGEN CONTROL
And/Or
NONPOINT SOURCE PHOSPHORUS CONTROL
Most
COST

cost, to achieve the goals. This is seen in Figure 2, with the highest assurance and most costly options on the left of the Figure, and the least costly and somewhat less certain means of achieving either Goal #1 or Goal #2 to the right. In all cases, it is clear that the Panel recommended maintaining the existing control program, which concerning algae control meant low levels of phosphorus discharges to the estuary from sewage treatment plants.

The means of reducing the frequency of occurrence of both nuisance and massive blooms (Goal #1) were divided into two categories: highest level of assurance and reduced level. The highest level of assurance and most costly control measures include point source nitrogen removal and upper basin (above Chain Bridge) reduction in phosphorus and nitrogen loads from point and nonpoint sources. In addition, the Panel recommended adoption of the "Overall Recommendation" to help control the sediment phosphorus source. A reduced level of assurance for achieving Goal #1 would involve implementation of only one of the control measures: implement nitrogen control or upper basin controls, in addition to the "Overall Recommendation".

The means of reducing the frequency of occurrence of massive blooms (Goal #2) were also divided into two categories: through external nutrient controls or through attempting to control the sediment phosphorus source. The external nutrient control approach involved either point source nitrogen control or nonpoint source phosphorus control. The alternative approach includes no additional actions beyond the existing program pending results from the research under the "Overall Recommendation". This latter approach would be the least costly alternative offered by the Panel.

Conclusions Which May Be Drawn from the Expert Panel Report

The 1983 Algae Bloom was clearly a complicated event, and the "Experts" on the Panel are to be commended for unraveling a major mystery and allaying a source of public concern.

What is apparent to us as local jurisdictions is that the control efforts we have taken and are continuing to take are beneficial to the estuary's water quality, and that while we must be vigilant in maintaining our existing program, there is substantial cause for optimism because for perhaps the first time in twenty years, municipal effluent was not the direct cause of the estuary water quality problems. It is therefore clear that we must now focus elsewhere, particularly on nonpoint sources and upper basin loads if we wish to ensure further progress and continue to decrease the frequency of blooms. The Washington region has contributed its share to improving Potomac water quality; let others now join us to complete the effort. An equitable sharing throughout the Potomac Basin of the burden of protecting this great water body is the logical conclusion to be drawn from the Expert's scientific report.

A Look Ahead

A number of important decisions were delayed pending completion of the Expert Panel deliberations, with the most notable among them the expansion and upgrading of the Blue Plains Wastewater Treatment Facility, the region's largest plant which serves nearly 2,000,000 of the metropolitan area residents. The continued growth and prosperity of the Washington area depends on implementation of this project, and it is clear, from a multitude of studies and analyses, including the Expert Panel Report, that expansion of the facility at existing effluent levels (which for the nutrient phosphorus are 50-75% lower than occurred in 1983) is completely consistent with maintenance of good water quality in the estuary. To assist the regulatory agencies in the pending decision process, the Water Resources Planning Board and Blue Plains Chief Administrative Officers have adopted a "Statement of Principles" from the local perspective to guide the decision process. These principles are as follows:

1. **The Blue Plains expansion should proceed immediately and be independent of all other activities and decisions.**

   Sufficient information is available to proceed - each day of delay costs money and threatens the region's future economic health. And in addition, a major component of the expansion is implementation of a permanent solution to handling sludge generated in the advanced treatment process; this solution will insure that Blue Plains can do its job of discharging only clean effluent into the indefinite future.

2. **The new Blue Plains permit should follow the recommendations contained in the 208 plan.**

   The local governments have adopted an area wide "208" plan for guiding pollution management decisions in the Washington region which recommends that the expanded plant comply with the existing stringent NPDES permit. This is entirely consistent with the Expert Panel report.

3. **All technical studies and other analytical work recommended by the Algae Bloom Expert Panel should be coordinated through COG.**

   This will insure local acceptance of future actions stemming from the new research, such as possible adoption of an alkalinity effluent standard.

4. **The timing and specific technical elements of the control strategy process should be subject to negotiations and consensus between the state and federal regulatory agencies and the local jurisdictions.**

   The ongoing partnership approach should be maintained.

5. **Any nutrient control requirements should be based on a proper balancing of the benefits and costs of various approaches. The frequency of occurrence of algae bloom events should be taken directly into account in this process.**

   While the Expert Panel identified alternative goals and strategies, it did not quantify the associated risks and benefits of each action, and it deliberately avoided any value judgement concerning the appropriate level of funding to implement a strategy. Any final decision by the regulatory agencies must necessarily include such a balancing, as recognized by the Panel.

6. **In order to implement these principles in the control strategy process, the Water Resources Planning Board and Blue Plains Chief Administrative Officers created the "Potomac Studies Policy Committee".**

Additional Recommendations by the Local Jurisdictions

Based upon these principles, the Potomac Studies Policy Committee has recommended that the regulatory agencies prepare an interim control decision early this summer to include the following components:

- Evaluate a possible alkalinity effluent standard to inhibit sediment phosphorus release;
- Expand the Blue Plains Wastewater Treatment Plant at its current permit level (this permit level is being comfortably achieved today) and set aside space for nitrogen removal facilities, should these be required in the future;
- Expand the Virginia treatment facilities at their current interim treatment levels;
- Examine seasonal phosphorus removal for all estuary dischargers; and,
- Establish a schedule for adoption of permanent standards.

Some Final Thoughts and a Few Comments on Pending Legislation

The local governments in the Washington, D.C. region are doing their share as responsible citizens to maintain the enhance the water quality of the Potomac Estuary. The 1983 Algae Bloom represented a turning point in the history of control efforts on the river, as it was the first time that municipal effluent was not directly involved in a river water quality problem. As we move ahead into the future, the local governments will continue to do their part but suggest that now is the time for others to join in by implementing comparable point source controls in the upper basin and downstream, and nonpoint source controls especially on agricultural runoff. Only through a combined effort can the restoration of the "nation's river" be guaranteed in the decades to come.

Turning to possible amendments to the Clean Water Act now pending in the Congress, I would like to bring to your attention that the above cited policies and principles of the WRPB for a clean Potomac would be directly affected by several of the proposed modifications in the reauthorization of the Clean Water Act currently pending before Congress.

As you know, both the House and Senate are working on separate bills at this time. Pending before the House is H.R.8 which is in markup at this time. A somewhat similar bill has been reported out of the Senate Environment and Public Works Committee, S.1128. We understand that passage of reauthorization legislation this year is likely after a House/Senate Conference Committee works out the differences between the bills.

We will briefly discuss the most important aspects of these bills as they might impact on the Potomac River. Hopefully, our comments will be helpful in making decisions on the merits of these proposed changes.

We would urge your support for three modifications that are currently reflected in one or both versions of these bills.

- We estimate that a major percentage of nutrient loadings in the Potomac are from nonpoint sources. Both the House and Senate bills would establish a nonpoint source pollution management requirement. It would require each state to develop and have implemented policies and programs designed to minimize the amounts of pollutants from sources such as urban storm water runoff, mine drainage, runoff from agricultural land and the like. It is envisioned that the state program would build on work already accomplished and involve regional and local units wherever possible.

- Both bills provide for a statutory base and funding for the Chesapeake Bay Program. We commend you, Mr. Chairman, and your colleagues from Maryland and Virginia for having this vital program included in these amendments to the Clean Water Act.

- The House bill proposes two amendments that would increase the capacity of local governments and their regional agencies to update and upgrade their areawide water quality management plans. H.R.8 authorizes funding for two more years of such management planning under Section 208 of the Act. COG/WRPB is the designated 208 agency in the Washington Area and would be eligible to receive funds to integrate all the new data and analysis currently available into the region's existing 208 plan.

Finally, there is a provision in the Senate's version of the Clean Water Amendments of 1985 commonly referred to as "anti-backsliding" which gives us a great deal of concern, and we would urge that the House oppose its inclusion in the final Conference bill. Section 114 of the Senate bill provides, in essence, that a renewed or reissued discharge permit shall not contain less stringent effluent limitations than the previous permit, even if the state or EPA subsequently issues effluent guidelines that are less stringent than those in the original permit. We believe this would be bad policy. States, with EPA approval, must periodically establish effluent guidelines which will attain EPA-approved water quality standards. The Act requires states to continuously examine both its standards and effluent guidelines to reflect new data and changing conditions. EPA would not approve a less stringent standard or guideline if such action would jeopardize the State's meeting the goals of the Act. The permit review mechanism should be free to reflect the changes brought about by new data and analysis.

Mr. Chairman, this concludes my remarks on behalf of the Metropolitan Washington Council of Governments. Thank you for this opportunity to share our news and ideas with you and your Committee.

Mr. **Barnes**. Mr. White, thank you.

Mr. Cole, let's see if we can pull a chair up and you can get to a microphone. I know Mr. Cole has no prepared statement, but I want to give you an opportunity to make any brief statement you would like to make informally before we go to questions.

Mr. **Parris**. Before we hear from Mr. Cole, I might inform the committee Mr. Cole has for 20 years lived on Mason Neck of the river. He is a nuclear physicist, a long-term member of and former chairman of the Virginia State Water Control Board. He designed and created the Upper Occoquan sewage treatment facility in western Prince William County, which puts effluent into the drinking water of 700,000 people in northern Virginia. He is a man of much accomplishment in this area.

Mr. **Barnes**. We are very pleased to have Mr. Cole appear before the subcommittee this afternoon. We welcome any comments you might have at this point.

STATEMENT OF NOMAN M. COLE, JR.

Mr. **Cole**. Mr. Chairman, Mr. Parris, other members of the panel, I appreciate the opportunity to appear before you because the Potomac River is really more of a hobby than anything else. I do not earn my living by it, it is just that we live on the river and have lived there for over 25 years and I have been actively involved in the river and its restoration.

I think the thing that I am most concerned about is the most recent study that came out concerning the algae problem that occurred in 1983. The report has been an excellent report, it focuses on many areas, but I think one of the greatest services that has been done is the concept that: first, it is an act of God, it was a rain and nothing could be done, and certain parts weren't involved. I think that is a bunch of hokum. I think if you read the details of that report, it clearly outlines the contrary.

I think the report goes a long way on focusing the concern of sediment release, phosphorus from sediment releases, and also pinpoints a very key mechanism of concern that we had never seen before in Virginia and other studies. We have had the problem where people have proposed seasonal treatment of phosphorus. This is where you relax the standards during the fall, winter, and spring months, and then make a standard more stringent during the summer.

We have had numerous cases where the phosphate is in the organic flows which come out of sewage plants. That will play out on the bottom sediment during the winter months, and then because of conditions that exist during the summer, they will literally burp back into the water system, and we experienced that dramatically in 1983 and the panel really did a super job of identifying a new mechanism that has occurred that causes that phenomena.

A typical mechanism we had seen in the past where there was a low oxygen content on the river bottom—we have seen it in Roanoke, we have seen it in certain parts of the Potomac River. This was really new. Also, they pinpointed that the river was experiencing extremely high pH, lack of buffering capacity, which is known as alkalinity, and one of the areas they pointed a finger at was the sewage plant, and in particular if you look on page 58, they pointed at Blue Plains. I think they only looked at Blue Plains. I think a couple of Virginia plants may have also been involved.

So I think one of the actions that might be undertaken very quickly and I think the responsibility is going to fall on the Environmental Protection Agency to see that the plants—not only Blue Plains but also the Virginia plants—ensure control over their pH and alkalinity, because the pH got to the high of 10 in the river during this most dramatic occurrence.

I don't believe that sewer plants are necessarily the whole explanation. There may be other factors, so I think additional research is needed to fully understand this phenomena. When you have sewage plants discharging below pH of 6, you have got an acidic condition and also the alkalinity was down.

This also disturbs me that further hearing the words, "It is not the sewage plants." It is always somebody else's fault or somebody's I think gross misreading of what the panel said.

I find it interesting that the panel recommended that the sewage plants considered nitrogen removal. That is a very dramatic change from what we have done before. Normally, in sewage, it comes in an ammonia form. If you ever smelled diapers you will know what I am talking about. And basically we go through a nitrofication process which converts ammonia over to nitrates. That is what a lot of the plants have been doing. That may also be a part of some of the plants causing a low pH. It turns out when you nitrify you do reduce pH unless you have some balancing treatment facilities.

Anyway, when you look at the other recommendations, recommended strategies proposed by this panel study, it is item after item associated with the sewage treatment plants. So please don't walk away with a concept that has been fostered by many that it is just Mother Nature, the act of God, sewage plants are not involved, isn't that great. I am sorry to be sarcastic in that but I see a super piece of work done by this panel that has been greatly distorted.

If you have any other questions——

Mr. **Barnes**. Thank you very much, Mr. Cole. We appreciate your testimony very much.

Gentlemen, other than what you have presented, do you have any specific recommendations for congressional action on the river quality, on the Potomac River quality? What actions would you recommend at this point that the Congress take to assure improvement of the water quality in the Washington area? Who would like to make a comment?

Mr. **Cole**. One of the concerns that comes out of a study, such as the algae panel study, is who has the responsibility to implement? Who is going to be overseer? Can the District of Columbia, Virginia, Maryland? Who has really got the weenie on that?

COG clearly is an agent of the sewer plant operators. They historically always boosted for more relaxed standards.

Here is a report that has dramatic implications if they are followed through, such as no nitrogen removal. Who is going to take the lead?

Virginia doesn't own the river, Maryland owns a portion of it. The District has a part of it. It is very unique as to who has the responsibility. EPA, in all honesty, I think, is going to have to have a central group that oversees this metropolitan area and forces the issue, forces to a head things such as disgust in the algae panel report, if we are going to stay on top of this situation.

You have a great report and I don't know, I think it is just one of those nice green reports on a shelf unless somebody figures out who has got the weenie for really overall responsibility and control of the river, because it is not only problems developing here, I believe there are problems upstream.

I know the Maryland plant has no phosphorus removal, north of town and south of town there is major expansion going on. The plant has no phosphorus removal. When you look at loads implied on the river, it is going to have a very negative effect of anything done directly in the metropolitan area.

It doesn't seem to be any one guy who says I have the responsibility and I am going to force coordination of this thing. I think it is a farce to expect Congress to do it. They are really an element of the sewer plant operators and anything that can be done to force that issue I think in the long run will have a major impact on the long-term viability of the river.

Mr. BARNES. Other suggestions or comments?

Mr. White.

Mr. Cole and I have been going around and around for quite a while and obviously we are not going to agree. I think he must have read a different report than I read from the conclusion he came to, but I think that on the face of the report, when anyone reads it, it speaks for itself. We are sick and tired of the fact that people are consistently bellying up on wastewater treatment in both the District of Columbia, Maryland, and Virginia, are doing now outstanding jobs. They are moving forward much further than they have in the past. When we do have a lot of problems in the river, the river just didn't get cleaned up by itself.

So I think that the need for some kind of control within the region may not necessarily speak to something that Congress needs to do. You need to continue the kind of cooperation that has gotten us to the point where we are now and that has been done primarily through COG. We are not a bunch of evil people that are running around trying to pollute the river. We have the same goals, we have the same mission, we have the same concerns.

We want the river clean and the waterway clean. We are going to do all things necessary to do that. We are achieving and far surpassing the standards and requirement of EPA at the present time. We are going to continue to do that. We are concerned about that in the Washington metropolitan area. All the operators are and we are going to continue to meet those requirements.

I think that the kind of support that we could receive from the Congress would be one that would continue to foster this kind of cooperation to possibly provide some additional funds in terms of the construction grants program continuation and that kind of thing. Because obviously the requirement that falls out and those things that must be met as a result of additional studies that come from the algae bloom report, if they indicate there has to be some additional expansion of waste water treatment plants and additional construction, some additional facilities added, because of the phasing out of construction grants program, obviously that burden will fall to the local jurisdictions and that will fall to those people—ratepayers that actually will carry the rate. Those costs will not be spread across the country through Federal dollars.

So our concern now is that while at the same time that we must meet the requirements of protecting the bay and the river, at the same time we also have to take into consideration those cost factors that have to be passed on to the ratepayers.

Mr. BARNES. Thank you.

Mr. Seif.

Mr. SEIF. If I may add also a remark or two. Who has the responsibility for a multijurisdiction over a river basin like the Potomac? I think EPA does. And in response to that, in effect, challenge, I accept that challenge on behalf of EPA. I think our presence here, our efforts from 1976 on, and our work with permit issuances—as Mr. White points out, the river didn't clean itself up. We had a lot of very long, expensive permit fights over who would load what into the river. The loadings are substantially less than they were 10 years ago and that is a success story.

With respect to returning to the multijurisdiction aspect, the Potomac River is like the Chesapeake Bay, many States are involved, many users, many different publics, and EPA in that context, in the Chesapeake Bay—accepts its role as an overseer, a catalyst, a coordinator, and invites this administration's continuing participation and interest in that, in general, the Congress in the Potomac River and the Chesapeake Bay. We will be back as often as the committee feels it is appropriate to report on the kinds of issues we have talked about today. We will be happy to be, and we are happy to have Mr. Cole's views as we look this summer to permit reissuance and on many plants he is discussing.

Mr. BARNES. Colonel Walsh.

Colonel WALSH. Congressman, our efforts in the water quality area of the Potomac River beside hydrilla and also in the area of shoreline erosion, is probably our major activity other than the hydrilla operation. And at that point, we are funded in keeping with our requirements and I think the ball is in our court right now. We are working with all of the States involved on the bay, it is a baywide program. We move all the way up to the tidal limits of the Potomac River. I think we are in good shape right now.

Mr. BARNES. Thank you.

Mr. Parris.

Mr. PARRIS. Thank you very much, Mr. Chairman.

This has been a very interesting testimony—to me, at least. I have been in and around the Potomac River and Chesapeake Bay in one capacity or another for more than a quarter of a century. I agree with Mr. White that the river is cleaner, much better. I also agree with Mr. Seif that EPA has the responsibility. This is a permit fight. I would remind you, Mr. Seif, that before your time, I spent 1 year trying to get the EPA to focus on the fact permit limits were not being met several years ago, by the Blue Plains treatment plant. They simply were not being met and nothing was being done about it, so Philadelphia was sitting on its prerogatives.

Now it is changed, it is better, making progress. My point is, I think the answer to the question Mr. White—and I am not an expert in all this—but the statement is made several times in your testimony, Mr. White, municipal immunity was not directly involved in a river water quality problem. Nonsense, in my view. It is not perfect, that is not, I don't think, consistent with common sense.

You can fly over the Potomac River and watch it grow in the summertime. Maybe I am being too simplistic. I don't think I gather from what Mr. Cole said that he agrees and as he indicated to you he has been a member of the State water control board for many years.

I am not being critical, certainly not. I don't mean to be critical personally, Mr. White, of you or COG, I think this report is generally good. My point is, I have to believe that there is some maybe even obscure connection between the efficiency of the sewer treatment water facilities in this or any other water basin and algae. Now, the condition is exacerbated clearly. I can understand that. But when you improve the operating permit requirement by EPA, in the Blue Plains treatment plant, you do better in algae. We saw it.

Your report indicates from 1971 or whatever it is, to 1980 or so, dramatic improvement. Why? Because the EPA was leaning on the local jurisdictions, including mine, to clean that mess up, and they did. It helped. Now, to have the suggestion parlayed I think excessively, that it is not necessary really to control the algae problem by increasing the permit application requirements and so forth, I think obscures the problems. I do not mean lack of good faith on the part of anybody, clearly not you gentlemen. But it is a continuing problem in my view.

On that, after having made those remarks, Mr. Chairman, let me ask just a couple of specific questions.

Mr Seif, you commented on the implementation of the District of Columbia combined sewer overflow control program, which has been one of our continuing problems in this area for 50 years. When it rains a great deal, the excess water runoff from storage drain sewer runs back into the sewer, that still happens today, right?

Mr. SEIF. Yes sir.

Mr. PARRIS. In the modern times in the real world we get raw sewage because of combined—that has nothing to do with Blue Plains, that is called life as we find it in the city, it is a fact?

Mr. SEIF. Yes.

Mr. PARRIS. My question is, when is that likely to be complete? That was in the 1984 construction program. Has it started? When is it going to be completed?

Mr. SEIF. I think Wallace White can help on that. I know our agency has funded phase 1 of that for $35 million, and depending on how that goes through design stage, and through 1989 construction; $35 millon is to be available. It is a very important problem and I think my testimony and your remarks indicate you can't tolerate the fact that you are going to exceed all your limits everytime there is a severe rain. The problem has to be addressed. It is being addressed at the moment.

Mr. PARRIS. So is it basically a $70 million program over 4 years? Is that essentially what we are looking at?

Mr. APP. No, it is $70 million in two phases. The first phase is $35 million, and that will entail construction through 1989.

Mr. PARRIS. When is the second phase?

Mr. APP. The second phase, when the 1989 construction is completed, there will be monitoring and reassessment of where we are, how effectively the controls have been, then decisions will be made to proceed. It may require some adjustments.

Mr. PARRIS. What percentage of the raw sewage that runs off into the Potomac River will be eliminated by 1989?

Mr. APP. The percentage of raw sewage?

Mr. PARRIS. Yes.

Mr. APP. I don't have the figures right in front of me but I can say that—when the program started, this was even before EPA funded, the Disrict had started a remedial program—I believe there was something on the order of about 6 or 7 billion gallons per year discharged. This was, say in the base year of 1978-79. Since that time, the discharge has been reduced—and Wallace might correct me—down to something like 3 to 4 billion gallons a year.

Mr. WHITE. Yes, sir

Mr. PARRIS. Fifty percent?

Mr. APP. That is where we are today. It will be reduced probably—I could get these exact figures for you—I would say maybe 70 percent.

Mr. PARRIS. So?

Mr. APP. By 1989.

Mr. PARRIS. So it will be 70 percent better over today 4 years from now, and we are 50 percent better off than we were 4 years ago?

Mr. APP. Yes sir.

Mr. PARRIS. What do we have to do to go the other 30 percent to eliminate the raw sewage runoff in the Potomac River?

Mr. APP. You will never eliminate the raw sewage runoff.

Mr. PARRIS. Unless you reconstruct the entire system in the District of Columbia?

Mr. APP. Yes, sir; unless you separated the entire system, which will be prohibitively expensive.

Mr. PARRIS. One other question, Mr. Seif. On page 14, you indicate that the long-term sludge program for Blue Plains will soon be in place. How soon is soon?

Mr. SEIF. May I turn to Wally on that, please?

Mr. WHITE. The final solution, at least the recommended solution that came out of the studies, which we are currently in the process of eliminating, 1991 is the year that we have for all those facilities to be in place and to be operational. That is the plan at the present time.

Mr. PARRIS. In the meantime how is the arrangement that was contracted between the local political——

Mr. WHITE. Five-year agreement in place right now. That is, to handle all emergency, all the sludge, those generated in the Maryland, District, and Virgnia.

Mr. PARRIS. Is that working well now?

Mr. WHITE. Yes, sir.

Mr. PARRIS. And the long term, that means through the balance of the century?

Mr. WHITE. That will take us to the year 2010.

Mr. PARRIS. That will clearly be implemented before the expiration of the existing agreement. Is that a fair statement?

Mr. WHITE. That is what we are aiming at, yes sir.

Mr. PARRIS. Let me just, Mr. Chairman, with your indulgence, I just want one general comment from Mr. Seif. In your testimony, you are considerably more friendly toward hydrilla than I am. I interpret it—I don't mean to be editorial—I interpret cursory references to hydrilla as a possible location, habitat for fish, as ignoring the problem.

I am going to go back to Colonel Walsh, if I can get his and Mr. Cole's attention. The numbers that we saw in the references to attachments to your testimony, Colonel, which you alluded to again in these remarks, 10 acres 2 years ago, 600 now, in 1985, 34,000 acres. If you look at the graphic, every single estuary in the Potomac River from here to Colonial Beach will be clogged with hydrilla in 10 years. Is that a fair statement?

Colonel WALSH. Congressman, my prediction obviously is subject to being wrong. Working of the growth rates that we in effect experienced through our literature research and in fact right before our eyes in the Potomac River, the limiting factor at this point are salinity, for this particular type of hydrilla, salinity, water temperature, and depth, and depth is dependent on turbidity. The depth that we are looking at right now is 6 feet, maybe down to 8 to 10 feet. The fact is if, according to some people's views, that is going to clear up the water, we have very specific locations of this hydrilla existing in clear water up to 40 feet deep.

I just might mention if you check a navigation chart of the Potomac River, you have to go all the way to 301 before you find water 40 feet deep. The problem as significant as the problem in the Potomac River, the dangers for the rest of the Chesapeake Bay, may even be more significant in that salinity level at 12 to 15 salinity level, for example, includes virtually all of the Rappahannock, it includes virtually all of the Chesapeake Bay north of Annapolis. So that the problem—I certainly don't want to be an alarmist, but the limiting factors are only a few, and when you apply them and look at each piece of hydrilla growing an inch a day—I was saying that it grew geometrically and I was correct a little later on to use the word expeditiously.

Mr. PARRIS. Mr. Seif says in his testimony, this can represent a nuisance. I respectfully submit, Mr. Seif, this is a lot more than a nuisance. I think it is a serious problem which will clearly impact on the Chesapeake Bay. It is a problem in the Potomac River which may in fact be out of control as we speak. I have flown over the Potomac River in the last week. I submit to you, Mr. Seif, that I saw a small boat stuck in the hydrilla right next to Mount Vernon this week. This isn't even growing season yet. That stuff is on both sides of the river all the way from Anacostia to at least Mount Vernon, and you cannot drive a boat down the Potomac River today if you get out of the channel.

This is not a modest nuisance, in my humble opinion. Again, I am just a poor Virginia country lawyer trying to do my job. I am not an expert, but I know a green monster when I see a green monster. Frankenstein is not just a huge toy, it is a danger, in my view, to this area and we better start doing something about it.

With all due respect, Colonel, to lay a few plastic panels around Belhaven Marina, OK, it is the neat thing to do and I congratulate you for doing it, and I appreciate what you are trying to do. Do you have any idea how many divers it would take? You would have to have everybody in your army with a diving tank and a spade to go down and pick up everything we have right now in the Potomac River. It is growing as you know, bisexually a million times reproduced. Each plant growing 1 inch a day, it grows miles every 8 hours. We are going to have to do something about it.

Colonel WALSH. If I might comment on the two methods you mentioned. We are looking at diver dredging and we are looking at very briefly both in time and in compared to other things, the dollars. We recognize it is, in my mind the most expensive but significant amount, but the idea of the diver is that we can move the diver in very quickly and in an area that is beginning to be infested and he can be, in effect, surgical in removing it.

The method may not work at all, in the Potomac River, and we are not really very positive about it. We think we should give it a shot and that is used in other areas already. If I had to guess what methods we were going to use in an utlimate control program, that would be one that I would question wouldn't be.

The second is the only places where we are anticipating using the matting would be in marina areas. It may prove to be effective over the longer haul, be the least expensive to have that method in the marina area, if it works and we can properly secure it.

The fact is even in the ultimate control program, using the number of 34,000 acres, for example, we would anticipate right now controlling no more than perhaps 2 percent of the whole area. To go further than that would be a prohibitive cost, and so again, using the 2 percent, that is where we would differentiate between which of the methods we might use in those areas.

Mr. PARRIS. The other 98 percent is going to grow up our waterpipes and come out and grab us by the hand, as I like to say, the giant green monster.

Colonel WALSH. We will pursue the control program to its fruition, but we will work always with the benefit-cost aspect of it.

Mr. PARRIS. I don't mean to deprecate what you are trying to do, Colonel. I just think the magnitude of this problem is greater, broader, deeper, and more significant than habitat for fish. We are talking about the Nation's Capital, and one of the principal recreation facilities of this area, Tantallon, Mike, I submit to you, the Washington Marina will be unuseable by the end of this summer. I will guarantee it. If that isn't a problem of a Member of Congress from Maryland, I don't know what it is. I will think of a better one for you if you don't like that one. It is going to be a very serious problem. I don't mean to belabor this point, gentlemen. I will go on to another subject here quickly.

Mr. White, in the COG study, you recommended relaxing the year-round phosphate discharge rate from 0.23 million grams per liter to 0.35 in the summer. Is there a reason for that specifically? Why is that, in terms of phosphorous discharge, phosphate?

Mr. White. That was only a review. It was not recommended that be reduced. We are not reducing anything.

Mr. Parris. So this is not a recommendation. Perhaps I misread it.

Mr. White. No, sir.

Mr. Parris. I thought there had been a portion of your report that recommended the reduction of that limitation. Is that not correct?

Mr. White. No, I don't believe so. No, it is not.

Mr. Parris. Mr. Cole is shaking his head yes, and you gentlemen are saying no. Is there a miscommunication in that area?

Mr. Cole. There is an April 13 report, 1985.

Mr. White. The same one we are talking about?

Mr. Cole. Here it is. It says can we have a decision on upgrading, and it says: "The panel's analysis seems to leave open the possibility of the removal of about 0.35." So the whole thing is——

Mr. White. That is the same thing.

Mr. Cole. That is the recommendation, to lower the standards. That is what it is. Go read it, it's just the English language.

Mr. White. Well, that is not what it means, then. Your interpretation of it, what it was written to say is not the way you are interpreting it. We are not recommending that we relax those standards.

Mr. Parris. So your language is "summertime," that is the critical word?

Mr. White. Yes, I am with you.

Mr. Parris. Mr. White, I am not alleging any lack of good faith on your part. I am just trying to understand where you are coming from. "That the summertime phosphorous limit, 0.35, called for in the Blue Plains feasibility study, is compatible with the panel's recommendation," the panel being algae bloom. You are not saying let's go from 23 to 35. What you are saying is if it is 0.35 it is still all right in terms of algae. Is that where you are coming from?

Mr. White. No.

Mr. Parris. Well, then what does it mean?

Mr. White. We are not recommending a relaxation of the standards.

Mr. Parris. OK, I will give you that.

Mr. White. Yes.

Mr. Parris. But if the standards were relaxed—and the gentleman who is going to relax them presumably is sitting right to your right—if those standards were relaxed don't worry about it in terms of algae?

Mr. White. Now you are raising an altogether different issue, and that has to do with what the rivers are able to assimilate, to be sure that we are protecting the river, and there is no degradation, all those things are yet to be determined.

The primary thing that came out of the expert panel review was that there should be a lot of additional studies done, including studies on those issues around alkalinity to determine what the impact would be, whether it is necessary, how it would be done, and those sorts of things.

Those things have not been accomplished yet, so those recommendations are there, and we are moving forward on them, to see that they get done. We are meeting the local jurisdictions along with the States and EPA to implement those recommendations, but that is still something yet to be studied. We haven't accomplished that yet.

Mr. PARRIS. Do you have any comments on the standards?

Mr. COLE. No. I really think the study you are referring to is this COG summary, and I think it clearly indicates to the District of Columbia that you might lower the standards when you expand the plant, and it even talks about—I understand the difference between what the District may buy and what COG may recommend.

I am reading what COG's words say. Hopefully, the District won't buy the words from COG, but it is clear that the implication is that from COG it is all right ot relax standards at Blue Plains in the expansion, and I think that is a misinterpretation of what the information coming out of last summer clearly indicates.

Mr. PARRIS. Just one last question, Mr. Chairman, and I appreciate your indulgence. I used to have a house that had a swimming pool in it. When we got algae in the swimming pool we put in acid and it took the algae out. That is really what you are saying in terms of pH control, isn't it, Norman? As the pH increases, you said 10 something——

Mr. COLE. As the pH got up I believe in the river to in the order of magnitude a pH of 10—and your neutral is around 7—when the river water got to around 10, it caused a massive release of phosphorous from the river bottoms that had been plated out from various sources. Once that phosphorous was released back into the water, you have just a massive source of nutrients to let the algae sort of just go rampant, and that is what basically happened. The real question is what caused the river to end up having such a high pH?

One of the things that was pointed out—and I believe it is on pages 557 to 559 in the panel's study—was that when we went to nitrification at Blue Plains, we lowered the alkalinity substantially coming out of the plant, and also the pH, and they said this may be one of the things that has led to the high pH in the river, because we reduced the buffering capacity being discharged from the plant.

When I questioned the panel had they looked at other plants, they had not, and in my own review of the technical data coming out of several Virginia plants, some Virginia plants may have also been involved in that.

Mr. PARRIS. Including the Pohick plant?

Mr. COLE. Right. And so what I hope is being done, and that the people are paying particular attention to the pH levels of their effluent. This has not been a major—people had not thought that this was a major concern as far as algae in the past. People were not doing it maliciously or anything like that. It was just an area of new knowledge that came into being in the summer of 1983 as a result of that, and so hopefully all the plants will begin to pay particular attention to that.

That is why I was hoping EPA will make a real conscious effort to begin to patrol that area, because I noticed even looking at one plant in May, in April—it wasn't yours, it was a Virginia plant—the pH was still running below 6, and that is way too much acid, and you are concerned about acid rain. Sewer plants can in essence produce the effect of acid rain, if you are not careful of how you operate them and be particularly conscious of them. So there are some real subtleties that we are learning here on the river, and hopefully EPA is in the middle of that.

Mr. SEIF. Yes, sir.

Mr. PARRIS. With that, I will suspend. Thank you, Mr. Chairman.

Mr. BARNES. This is obviously a discussion that we could continue for a great length of time, but we don't have it this afternoon, and we have already taken a lot of time of the witnesses. I want to thank all of the witnesses for their testimony. We haven't solved all the problems but we have made some progress. I think it is particularly heartening to see that the problems that we are talking about this afternoon, recreational safety to nonpoint sources to hydrilla, all difficult problems to solve, are not being ignored by the people who are in key positions to deal with them.

We have had those people before us this afternoon. Neither are they being rationalized or exaggerated. They are being taken very seriously. Solutions are being sought by the responsible parties. Cooperation among and between agencies, Federal, State, local, is readily apparent from what we have seen this afternoon.

It may be, however, that still more cooperation and coordination on the problem of recreational safety is in order quickly, perhaps a mutual-aid pact such as we discussed earlier with better defined responsibilities and better distributed manpower. Perhaps a centrally coordinated recreational safety educational program would get greater public exposure, and that is something that everyone talked about during the session this afternoon.

I think we ought to explore these possibilities. I am delighted to hear a willingness on the part of our witnesses to do so. I look forward to reports on their progress and the progress of all of the expert witnesses we have here this afternoon, in solving the very real problems of the Potomac River.

Again I thank all the witnesses for taking the time and trouble to prepare testimony and to appear here. It has been a very instructive and informative hearing, and I think we have got a lot of work to do both in and out of the Congress on these issues. Thank you very much.

[Whereupon, at 4:40 p.m., the subcommittee adjourned.]

[The following additional material was subsequently received for the record:]

STATEMENT FOR THE POTOMAC RIVER HEARINGS OF THE SUBCOMMITTEE ON GOVERNMENT OPERATIONS AND METROPOLITAN AFFAIRS, COMMITTEE ON THE DISTRICT OF COLUMBIA U.S. HOUSE OF REPRESENTATIVES

May 29, 1985

by

Paul W. Eastman, Executive Director
and
Daniel P. Sheer, Director, CO-OP Section
Interstate Commission on the Potomac River Basin
6110 Executive Blvd., Suite 300
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Progress has been substantial in correcting both water supply and water quality problems in the Potomac River Basin since the comprehensive Potomac River hearings held in 1976 by a subcommittee of the House District Committee. Metropolitan Washington's water supply crisis of the 1970's was solved by largely innovative and low-cost management techniques, but as so often is the case when good news displaces the bad, the solutions to the crisis have received little recognition. Also, notwithstanding the valid concerns about the 1983 algae bloom in the upper Potomac tidewater and the appearance of the nuisance submersed aquatic plant, Hydrilla, the water quality of the Potomac and its tributaries, including the tidewater, generally is good and improving.

Water Supply

In 1985, the Washington Metropolitan Area Water Supply Coordination Agreement among the District of Columbia, the Washington Suburban Sanitary Commission, the Fairfax County Water Authority, the U.S. Army Corps of Engineers Baltimore District and the Interstate Commission on the Potomac River Basin Section for Cooperative Water Supply Operations (ICPRB CO-OP), may well get its first acid test. Extremely low rainfall through the winter and early spring has doubled the potential for serious drought. This is nowhere more apparent than in the communities to the north, in Pennsylvania, New Jersey and New York, where water use restrictions are already in place. Indeed ICPRB CO-OP forecasts (see Attachment 1) indicate that historically low flows are possible in the Potomac this summer.

Regardless of the flows, we are confident that the facilities, including the Army Corps of Engineers' Bloomington Reservoir completed in 1981 about 200 miles upstream from Washington, and the coordinated operations and other agreements which have been placed in operation since 1982 will allow the Washington Metropolitan Area to make it through the summer of 1985 without restrictions on water use. The drought exercises (the equivalent of "war games") conducted in 1982, 1983, and 1984, have demonstrated our ability to deal with droughts substantially worse than the drought of record. While no rain for months on end and a consequent water shortage is theoretically possible, it would take a substantially less than record low rainfall during the summer and fall before restrictions on water use would be necessary.

For almost 30 years prior to 1982, the Washington Metropolitan Area was thought to have a totally inadequate supply of water for municipal and industrial purposes. Proposals to increase that supply over the period ranged in cost from hundreds of millions to billions of dollars. However the agreements reached in 1982 involved primarily non-structural measures designed to improve supply by efficient joint operations of existing facilities and the construction of a low-cost small dam (Little Seneca in Montgomery County, MD, completed in 1985) which added operational flexibility. The result has been a sufficient increase in the effective yield of existing water sources to ensure an adequate supply for years to come at much less cost.

The techniques used in the Washington Area are certainly applicable throughout the country. Implementing them requires the political courage shown by Washington Metropolitan Area leaders in agreeing to pool their resources for the benefit of all. Attachment 2, an article in the June 1983 issue of Civil Engineering Magazine (Cooperative water supply agreements for the Washington Metro Area, based on state-of-the-art management techniques, ended a 30-year search for solutions to the region's recurring water shortages) briefly describes the background and agreements leading to the present assurance of adequate public water supply for the Washington Metropolitan Area well into the next century.

Water Quality

As mentioned previously, the water quality of the Potomac and its tributaries generally is good and improving. It is under stress in some areas and even poor in a few others, but generally it continues to provide both residents and visitors with drinking water, commercial and sports fishing, swimming, boating, and other beneficial uses.

Especially in the past ten years many municipalities and industries have completed the upgrading and expansion of existing water pollution control facilities or the construction of new facilities. Nearly a billion dollars has been spent for this purpose in the Washington Metro Area. Relatively few of the municipal and industrial point sources in the basin have yet to provide the necessary new or upgraded treatment plants or other controls to remedy their pollution problems, and most of these have construction programs underway or scheduled.

The major remaining pollution problems in the basin are largely from nonpoint sources. The nonpoint source pollutants of special concern are sediments from land erosion, nutrients in any form that reach receiving waters by surface runoff or any other pathway, waste products including bacteria from farm animal production, urban storm and combined sewer overflows, acid drainage from abandoned mines, and the recycling of pollutants from river bottom sediments.

The damages to water uses by the dispersed, human-affected, stormwater runoff from urban and rural lands and the related water quality trends in the Potomac tidewater are difficult to evaluate and to link specifically with upper basin causes. For example, the EPA Chesapeake Bay Study highlighted as evidence of the degradation of the Bay, which includes the tidewater Potomac, the disappearance in many areas of submersed aquatic vegetation (SAV's) and the decrease in fish which spawn in fresh and low salinity waters (e.g., shad and striped bass). Over the same period the study showed that nutrients allegedly increased overall in the Bay from both point and nonpoint sources. Although the study concluded that the circumstantial evidence is strong, it could not definitely link the declines in SAV's and the fish spawning in fresh and low salinity waters to the increase in nutrients, especially from nonpoint sources, and other indications of water quality deterioration.

Nonpoint source nutrients especially are associated with runoff from rural agricultural lands. However the proportion of land use for agriculture, both crop and pasture lands, has decreased substantially with corresponding increases in forest and urban-residential land use. Although more fertilizers are used, the increased practice of low-tillage agriculture causes less land disturbance, less soil erosion and less runoff of sediments and associated nutrients.

Recent studies by ICPRB and others show that the period of maximum erosion in the Potomac River Basin extended from approximately 1840 to 1920. Erosion has been reduced in the current century by both the transformation of agricultural land previously mentioned and improvements in soil conservation beginning in the 1930's. However the decline in erosion rates in the upper Potomac River Basin has not been matched by a corresponding decline in sediment yield to the Potomac tidewater. Substantial channel and floodplain storage of sediment and associated nutrients apparently has been occurring. This suggests that nonpoint source control programs which are based on reducing sediment erosion may be effective only over limited distances and over very long time periods. ICPRB will be conducting a field study in the summer of 1985 to develop a sediment budget for the main stem of the Potomac from Point of Rocks to Little Falls and to determine the role this segment of the river, especially Seneca Pool and above, plays in storing sediment and reducing the delivery of associated nutrients to the tidewater Potomac.

Few, if any, would doubt that water quality in the Bay has deteriorated, at least until around 1980, the end of the period in which data were used for the EPA Bay Study. Coincidentally 1980 was the same time when water quality improvements began to be increasingly noticeable in the Potomac tidewater as the advanced waste treatment at municipal point sources in the Washington Metro Region became effective. Therefore the 1983 blue-green algae bloom in the 25-mile segment of the tidewater from below Washington to near Quantico Creek was distressing to say the least. It occurred at the same time that oxygen levels in the upper tidewater were better than ever in recent decades and phosphorus loads from Metro Washington municipal point sources had been reduced by more than 90% from 1970.

Concurrently in 1983, the U.S. Geological Survey in its studies of the Potomac tidewater identified more than ten species of submersed aquatic plants that had returned for the first time since the early 1900's when some of them were abundant on the shallow flats downstream from Washington. Most were desirable native species, but among them was Hydrilla, an import from southeastern Asia which is considered a nuisance plant in other parts of the United States. In 1984 populations of both native plants and Hydrilla increased greatly. In contrast with the 1983 blue-green algae bloom, the return of the submersed aquatic plants is a sign of better water quality in the tidal Potomac along with the greatly improved oxygen conditions, the flourishing sport fishing in the region, and other indicators.

Thus were receiving mixed signals from the Potomac tidal river and estuary which ICPRB and others under the umbrella of the Potomac Strategy Committee are studying to determine what they mean, why they are occurring, and what can be done about them in both the short and long terms. Nevertheless, we feel that there is ample reason to be pleased with the achievements at the same time that we are frustrated by our inability to better understand the role of nonpoint source sediment and nutrients and the degree to which they can be controlled efficiently along with the highly visible problems such as the 1983 blue-green algae bloom and the nuisance Hydrilla. We also feel that we have learned much and are continuing to learn from the progress to date in the complex Potomac tidal river and estuary which is valuable to the much larger Chesapeake Bay cleanup program as a whole.

ICPRB CO-OP WATER SUPPLY OUTLOOK

May 20, 1985

The water supply outlook for the Washington Metropolitan Area has improved slightly since mid-April due to above normal precipitation in early May. As of May 20, Occoquan and Patuxent reservoirs were both above 90% of capacity.

The probabilities of Potomac River flow at Little Falls falling below 1000, 900, 800, and 700 mgd this summer have been estimated using the CO-OP Water Supply Forecast System ("Conditional Probability of Lower Flow"). Estimates based solely on historical streamflow are listed under "Historical Probability of Lower Flow".

The results are as follows:

Water Supply Outlook
May 20, 1985

Flow (mgd)	Conditional Probability of Lower Flow	Historical Probability of Lower Flow
700	.28	.20
800	.43	.29
900	.58	.39
1000	.70	.49

During a dry summer water supply releases would be required from Bloomington reservoir beginning in late August.

INTERSTATE COMMISSION ON THE POTOMAC RIVER BASIN

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WATER SUPPLY

Cooperative water supply agreements for the Washington metropolitan area, based on state-of-the-art water resources management techniques, ended a 30-year search for solutions to the region's recurring water shortages. OCEA nominee.

In 1982, the Washington metropolitan area took an important step that will optimize water supply well into the 21st century. Yet no large reservoirs were built, no new wells drilled, no large pipeline constructed.

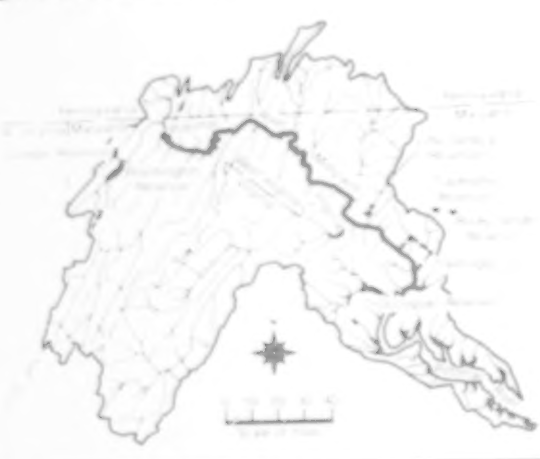
This feat was accomplished by state-of-the-art water resources management techniques that substantially increase the yield of existing supplies, including Bloomington Reservoir, meet future water demands, and improve the aquatic environment.

Implementing these innovative operating procedures required eight separate agreements among agencies including the U.S. Army Corps of Engineers, the states of Maryland and Virginia, the District of Columbia, two local utilities, and the Interstate Commission on the Potomac River Basin. These were signed on July 22, 1982, culminating three decades of uncertainty about the water supply of the area.

During that period, the population of the region doubled under the cloud of an uncertain water supply. Severe droughts of the mid-1960's came and went. Solutions were proposed including as many as 16 major reservoirs, recycling of estuarine water containing a substantial proportion of treated wastewater, drilling new

FIGURE 1

POTOMAC RIVER BASIN



Major reservoirs serving metropolitan Washington, D.C. are indicated. Triadelphia and Rocky Gorge reservoirs are along the Patuxent River in Maryland.

This article is based on material prepared by Dr. Daniel P. Sheer of the Interstate Commission on the Potomac River Basin and Kevin Flynn, formerly with ICPRB and now with the Water Pollution Control Federation.

Reprinted from Civil Engineering Magazine, ASCE, June 1983

well fields, high flow skimming, and assorted other ideas. The alternatives ranged in cost between $[illegible] million and over $1 billion in current construction dollars, each brought with it attendant political, social, environmental or economic difficulties. By 1977, after 25 years of study, the problem was nowhere near solution.

In contrast, the agreements reached in July 1982 are based primarily on almost costless cooperation, improved operation of existing facilities using state-of-the-art flow and daily demand forecasting techniques. Construction of one small local reservoir (Little Seneca, costing $[illegible] million) is included, but even that reservoir is important not so much for the quantity of water it stores, but for the additional operational flexibility it provides. Overall, system yield has been increased by nearly 50%, and individual project yields by as much as 250%. Improved operations not only meet water supply needs for decades to come, they also provide substantial instream flow and water quality improvements.

This success story is indicative of the "coming of age" of the application of systems analysis techniques in the field of water resources engineering. Engineering achievements include:

- The combination of optimization and simulation techniques to provide practical rules for operation of the entire system.
- The first large scale implementation of the National Weather Service River Forecast System (NWSRFS), based on a soil moisture accounting model and its direct integration with reservoir operations.
- The development and implementation of a technique to predict water demand and the application of that technique in water resource system design and operation.
- The combination of distribution analysis and hydrologic modeling to develop operating procedures for a complex water distribution system—one that includes many independent water suppliers.
- The use of risk analysis to identify the start of potential droughts and to quantify the risks of continued drought.
- The use of "drought games" to test and improve water supply operating procedures and to illustrate the use of those procedures to decision makers.
- Use of a small local reservoir (Little Seneca) to augment the yield of upstream impoundments. The reservoir is used to compensate for errors in flow forecasting.

A FICKLE RIVER

The Washington Metropolitan Area relies largely on the Potomac River for water supply. But the Potomac is virtually unregulated; its flow varies from extreme flood—over 250 billion gallons per day—to extreme drought: less than 400 million gallons per day at Washington.

In the years since the record low flow of September 1966, the area's combined Potomac withdrawals have often exceeded 400 million gallons per day. The operating procedures implemented in July 1982 provide dependable supply for Washington of about 950 million gallons per day.

The Potomac at Washington drains over 11,500 sq mi with an average flow of about 6 billion gallons per day. The drainage is almost entirely uncontrolled. The only sizable dams in the basin are

An intake at Little Falls on the Potomac River during the 1966 drought. Area water demand during the drought nearly drained the river dry.

Coordinated regional operation of water supply facilities is the key to optimizing water supply.

at Savage River and Bloomington, both in the headwaters of the North Branch in Western Maryland and West Virginia, over 200 miles upstream of Washington.

Coordinated regional operation of water supply facilities is the key. Operation of local reservoirs is meshed with that at Bloomington Dam, completed in 1981 by the U.S. Army Corps of Engineers and the recipient of the American Society of Civil Engineers 1981 Award of Merit.

Three suppliers provide nearly all of the water supply needs of the Washington area. The Washington Suburban Sanitary Commission (WSSC) provides water for suburban Maryland, and the Fairfax County Water Authority (FCWA) provides water for most of Fairfax and northeastern Prince William counties in Virginia. The Washington Aqueduct Division, U.S. Army Corps of Engineers (WAD), wholesales finished water to the District of Columbia, the County of Arlington, and the city of Falls Church, Virginia.

The area has three primary sources of raw water. Until 1982, when a new 200 mgd intake and 50 mgd treatment plant on the Potomac were completed, the FCWA met nearly its entire demand from the Occoquan Reservoir at the mouth of the Occoquan River. The reservoir has about 11 billion gallons of useable storage and a "safe yield" of 55 mgd. It feeds two treatment plants with a combined peak capacity of 112 mgd.

The WSSC takes most of its supply from the Potomac through a 400 mgd intake and 240 mgd (peak) treatment plant located just downstream of the new FCWA intake. In addition, the WSSC has two reservoirs on the Patuxent, with a combined useful storage of about 10 billion gallons. The Patuxent reservoirs have a combined "safe yield" of 45 mgd, 10 mgd of which is committed to maintaining flow below the lower dam. The peak capacity of the Patuxent treatment plant is 65 mgd.

The WAD is entirely dependent on the Potomac for supply. It has two intakes, a 200 mgd gravity intake at Great Falls, and a 430 mgd pumping station at Little Falls just above the District line. The WAD intakes are the farthest downstream of the three major suppliers.

SUPPLY AND DEMAND

By 1977, average Washington area demands during the summer months were often in the range of 450 to 470 mgd. The sum of the independent "safe yields" of all sources available for the Washington metropolitan area, including that of Bloomington Dam (then nearly four years from completion) was and is 513 mgd. Peak day demands had well exceeded this number. Withdrawals from the Potomac had surpassed the 423 mgd dependable flow. The Corps' North East Water Supply (NEWS) Study was predicting the possibility of regional shortages as large as 80 mgd by 1980, and 365 mgd (almost 35%) by the turn of the century. The Fairfax County Water Authority, as yet without a Potomac intake, nearly emptied its Occoquan Reservoir that year, and Fairfax County nearly closed schools and businesses in a desperate attempt to save water.

In the late spring of 1977, the Interstate Commission on the Potomac River Basin (ICPRB) first realized that altering operations of existing water supply facilities had not been adequately considered in previous regional water supply planning efforts. In particular, ICPRB performed an analysis which completely abandoned the concept of "safe yield" operation of the Patuxent and Occoquan Reservoirs, concentrating instead on the maximum yield which could be derived if operations at those reservoirs were better coordinated with the free-flowing Potomac.

Safe yield of a reservoir is generally defined as the constant rate of withdrawal which will just empty the reservoir given a repeat of the worst drought in the historical record. During the drawdown, withdrawals exceed inflows and the minimum storage (0) occurs just as inflows begin to exceed withdrawals.

The analysis continued and total water requirements in the year 2000 were projected at 750 mgd. The 90-day-long, 50-year recurrence interval low-flow in the Potomac was 580 mgd. This 90-day duration flow produced the worst deficit. The total deficit over the 90-day period would be (750 mgd × 90 days = 67.5 billion gallons) minus (580 mgd × 90 days = 52.5 billion gallons) equals deficit of 15 billion gallons.

But the storage in the Occoquan and Patuxent reservoirs alone totaled almost 20 billion gallons. Conclusion: the Washington area was not short of water if it could only efficiently use the already available local storage.

THE SEARCH FOR FLEXIBILITY

Two interconnection studies were performed by the U.S. Army Corps of Engineers, one dealing with cost, sizing, and operation of raw water interconnections, and a second investigating the potential for improving yield by improving the existing distribution systems and perhaps expanding the treatment plants for the Potomac and the local reservoirs. These were called finished water interconnections.

The concept behind the finished water interconnection study was as follows: when Potomac water was available, the use of the reservoir treatment plants would be reduced to well below their "safe yield"; the water thus saved would then be available to support use of the reservoirs at well above the safe yield level when the Potomac flow was low. Modest treatment plant expansion might be required to meet peak demands when either the Potomac was low, or use of the reservoirs was being minimized, and new distribution lines would be constructed to allow such operations while maintaining adequate pressure.

The conclusions of the finished water interconnections study were unexpected. No amount of construction of new distribution lines could increase the ability to im-

ANOTHER APPLICATION: HYDROPOWER

The Washington area project is a dramatic example of the value of the improved analytical techniques that have been developed over the past 20 years. Some of these techniques are also being applied in the hydropower industry. A few large systems make use of forecast and simulation models to help schedule operations and improve power output. The unique accomplishment of the Washington project is that it is the first application of these and other water resource management techniques to municipal and industrial water supply.

Scheduling of operations in the hydropower generation field is, in fact, a much more difficult problem than scheduling water supply for municipal or industrial consumption, and gains in efficiency in this area have been incremental. Nonetheless, substantial progress has been made, especially in the Columbia River Basin, the central valley of California, and by the TVA. The difficulties are due to the prevalence of multiple reservoirs and the need to consider not only water *quantity* but also the *head* behind each dam in the system. Existing contracts and commitments must be met, further constraining system operations.

The advances in the Potomac River Basin build on much of the work done in the power industry. With further advances in computer technology and additional analytical tools, we can expect to see tremendous gains in efficiency of hydropower generation in years to come.

prove yie[illegible]y altering system operation. To the contrary, the existing distribution systems, using existing interconnections, with proposed improvements required for *normal*, non-drought operations, could be operated so as to ensure the availability of water to support the peak capacity of the reservoir treatment plants whenever the Potomac was low. In fact, simulation of operations using 2030 demands failed to lower the reservoirs below 40% of capacity.

When required, releases from the Bloomington Dam, 200 river miles—and several days—upstream from Washington, are scheduled using demand and flow forecasting techniques. The release is set to assure a very low probability of shortage, given the uncertainty in the forecasts and the availability of local supply downstream.

Downstream operations strive to maintain balanced storage in the metropolitan area reservoirs on a daily basis. Modest daily corrections balance the system. Weather information, upstream flow conditions, and other factors are fed through a central computer system to aid in allocating the flow of the Potomac River and reservoirs.

When completed, releases will be made from the new Little Seneca reservoir to fine-tune the Potomac flow and to compensate for errors in the five-day forecasts used to compute the upstream releases. The upstream releases currently made to account for this uncertainty must be so large that up to 70% of the water actually released from Bloomington may flow by the intakes unused. When Little Seneca becomes operational, this water can be conserved.

Providing the Washington area with an optimum water supply was a complex engineering, social, economic, environmental, and institutional problem. Large scale structural solutions had been proposed and found wanting. A fresh approach was required. It was provided by advances in water resources engineering analysis over the last 20 years.

The techniques of water resources engineering systems analysis—linear programming, synthetic hydrology, statistical analysis, hydrologic modeling, and computer simulation—were adapted to produce a predominantly non-structural engineering solution to the problem. Many of the techniques were used together for the first time, and others were subject to major modification specifically to address this problem.

An "insoluble" problem of almost 30 years standing was resolved. The "impossible" task of achieving regional cooperation was accomplished. Between $200 million and $1 billion were potentially saved compared to previously evaluated alternatives. Moreover, the solution was not achieved at great environmental expense.

Perhaps the most important aspect of the solution to the Washington area water supply problem is the example it sets. Here is proof that non-structural engineering alternatives, including better management of existing facilities, can solve some of the most difficult sociopolitical problems and achieve substantial cost savings. Because the replacement value of our existing facilities is substantially greater than the present value of expenditures on new facilities at current rates, the potential benefits of widespread application of the types of engineering analysis used in the Washington area are enormous.

Credits: *System Development and Design*—Technical Committee of the Washington Metropolitan Area Water Supply Task Force (consisting of the technical heads of the following organizations: Washington Suburban Sanitary Commission, Fairfax County Water Authority, U.S. Army Corps of Engineers Washington Aqueduct Division, and District of Columbia Dept. of Environmental Services); U.S. Army Corps of Engineers Baltimore District (Washington Metropolitan Area Water Supply Study); Interstate Commission on the Potomac River Basin; National Weather Service (River Forecast System); Johns Hopkins University Dept. of Geography and Environmental Engineering; U.S. Geological Survey; Maryland Dept. of Natural Resources; Virginia State Water Control Board; Metropolitan Washington Council of Governments.

AUDUBON NATURALIST SOCIETY
OF THE CENTRAL ATLANTIC STATES, INC.

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CONSERVATION
ENVIRONMENTAL EDUCATION
NATURAL SCIENCE STUDIES

5/85

Edward M. Risley
Chairman, Conservation Committee
Audubon Naturalist Society

Hydrilla is now firmly established in the Potomac River Estuary and is growing vigorously along the banks and in depths up to six feet. It is sometimes found in mixed communities of grasses and plants such as Milfoil and Elodea and is generally in locations where there has been no submerged vegetation for the past thirty years. Densest patches of Hydrilla are found in Dyke Marsh. The incidence of the plant up and down both shores of the river indicate that it cannot be successfully eradicated at this point.

A number of studies made in Florida show that Hydrilla has positive values as a food source for ducks and fish along with its properties of cleaning water and protecting shorelines against erosion. While not the plant of choice, Hydrilla shares the desirable qualities of other SAVs and generally is better as a constituent of the environment than no vegetation at all.

Initial high levels of concern over the appearance of other aquatic exotics, such as water chestnut, subsided as an apparent niche in the ecosystem was occupied without, as it turned out, great adverse effect. Like the other exotics, once in the system Hydrilla cannot be eradicated.

What then would be a sensible course to follow with Hydrilla? First of all, there should be study and observation in its new Potomac surroundings and in laboratories to determine its growth cycle and interaction with other organisms. Where necessary, as around marinas or in ponds where boating may be interfered with, some mechanical or manual harvesting or "mowing" may be in order. Toxicology studies done for the city of Seattle identified carcinogenic properties in one popular herbicide. In addition, the inability of herbicides to discriminate among target plants argues against their employment on a broad scale in an open water environment. For locations such as Dyke Marsh and similar natural areas the best policy is to wait and see and not succumb to "hydrilla madness."

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Conduit Road Fire Board, Inc.
Glen Echo Fire Department
5920 Massachusetts Avenue
Bethesda, Maryland 20816
(301) 229-3200

IN REPLY REFER TO

May 1, 1985

Honorable Michael D. Barnes, Chairman
Subcommittee on Government Operations
and Metropolitan Affairs
Room 1310, Longworth House Office Bldg.
Washington, D.C. 20515

Dear Mr. Barnes,

Thank you for the opportunity to comment on the problems which we face on the Potomac River, in the vicinity of the Little Falls Pumping Station and Dam.

Unfortunate as it is, hardly a summer goes by without a tragic drowning occurring at this location. This was all too vividly demonstrated on May 5, 1984 when the dam claimed several persons at one time. Because of the design of the dam, with its ability to retain its victims, we have had very little success in our rescue attempts.

Over the years we have found that two major problems confront us. One the delay of notification of a person in trouble and poor access to the entire width of the dam.

Our approach to the face of the dam from down river is limited to within 100-150 feet because of the very real danger of our Rescue Boat and its crew being drawn into the fatal hydraulic effect created by the dam. Our means of access from up river is to approach the dam at a point mid-way across at Snake Island. However, once reaching the island, our rescue attempts are successful only if the victim is on the Island or within a few feet of the Island.

Over the past five to seven years the majority of successful rescues at this location have been achieved with the use of the U.S. Park Police and Maryland State Police helicopters. However, the present helicopters in use have their limitations which indicate to me the need of a larger type helicopter which has the ability to hover longer and the capability to lower and retrieve personnel.

The current efforts that have been taken to warn the general public should be sufficient for a person of average intelligence. However, I am convinced that unfortunately there will always exist that small group of individuals who for a lack of a better word are to be considered fools. Their total disregard for the very conspicuous warning signs which are posted at and above the dam leaves no other explanation.

The final items which I would like to address is that of communication on the River. For several years we have known that at times, due to atmospheric condition and the topography surrounding the River our mobile and portable equipment are unable to reach the Montgomery County Fire/Rescue Communication Headquarters located in Rockville, Maryland. It is felt that if a repeater site were located in the area of Carderock, that this would greatly enhance our transmitting and receiving capabilities.
To date, because of fiscal restraints this repeater site has not been constructed. The cooperation which we have experienced between the different State and Federal agencies at the time of an emergency incident has for the most part been satisfactory.

One again, thank you for affording us this opportunity to make the preceeding comments.

Sincerely,

Philip M. Stillerman
Chief G.E.F.D.

NATIONAL CAPITAL PLANNING COMMISSION

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EXECUTIVE DIRECTOR
Reginald W. Griffith

In Reply Refer To:
NCPC File Nos. 1200 & 0324

May 22, 1985

Honorable Michael D. Barnes
Chairman
Sub-Committee on Government Operations
and Metropolitan Affairs

Dear Congressman Barnes:

Thank you for your letter of May 6, 1985 regarding the oversight hearings on the state of the Potomac River now scheduled for May 29, 1985.

You have asked about the Commission's assessment of the various activities related to water quality and safety, as well as an analysis of those aspects of the Comprehensive Plan for the National Capital which may affect future uses of the Potomac.

This Commission has an on-going interest in, and has taken strong supportive positions regarding, improvement of the quality and use of the Potomac River and its environs. We would not, however, be directly involved in water safety issues unless some Federal agency found it necessary to construct safety-related physical facilities in and/or near the River, or wanted to so the same thing on Federally-owned land adjacent to the river. In such cases, the Commission would have to review site and building plans according to the National Capital Planning Act of 1952, as amended*. To date no such plans have been submitted for Commission review. The Commission has not been involved in the hydrilla problem in the Potomac and probably would not become involved except under the conditions mentioned above.

Our concern about water quality in the Potomac River and its tributaries in the National Capital Region is longstanding and intense. The river is part of the natural setting for the National Capital, and a major goal of the Commission's adopted Comprehensive Plan is to "conserve the natural features and resources of the National Capital and enhance cultural and recreational opportunities and open space of the Region." One way to do this is by "promoting and completing a system of shoreline parks which maximize public access along the shores of the Potomac

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* (40 U.S.C. 71-71i, 72, 73, 74 & D.C. Code, secs 1-1001 to 1013).

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and Anacostia Rivers." More specifically, the most relevant Commission policies are contained in the Parks, Open Space and and Natural Features and in the Federal Environment elements of the Comprehensive Plan. Included are such policies as:

> The entire Potomac and Anacostia river system should be a constant source of natural enjoyment, urban orientation, and visual delight. Its major features should be retained and enhanced as great natural Open Space resources and as recreational opportunities for residents and visitors;
>
> Efforts should be continued to improve the quality of water in the Potomac and Anacostia Rivers, to allow for increased recreational use. Swimming and fishing facilities should be planned and provided, as well as water oriented tourists activities, as the water quality improves;
>
> The shorelines and waterfronts of the Potomac and Anacostia Rivers within the District of Columbia should be publicly-owned, except as planned waterfront locations in Georgetown and Buzzards Point where controlled private development could be permitted. Public access along the waterfront should be accommodated throughout, including waterfronts on military properties when security considerations will permit. In non-public waterfront areas, access by the public should be arranged by easements or other binding agreements;
>
> All lands within 150 to 200 feet of the water's edge along the Potomac and Anacostia rivers should be managed in a manner that will encourage the enjoyment and recreational use of water resources, while protecting the scenic values of the waterways;
>
> Natural shoreline areas in the National Capital Open Space System should be retained in their natural condition or be appropriately landscaped for a distance of 150 to 200 feet from the waters edge if possible. Large paved parking areas and other non-water related development should be discouraged within this area. Existing large parking areas, such as the Pentagon's north parking lot along Boundary Channel, should be removed as soon as feasible and the area restored to a landscaped condition with active or passive recreational uses; and
>
> Natural shorelines should be protected from erosion through appropriate control measures which retain the natural beauty of the riverfront, yet serve to reduce siltation in the waterways.
>
> Vegetation buffers should be provided and maintained adjacent to a body of water to reduce sedimentation and delivery of pollutants, where praticable;

> Thermal pollution of waterways should be discouraged to protect fish and other aquatic life;
>
> Sewage treatment sytems in the Region should be upgraded where necessary, in accordance with the standards and guidance of the U.S. Environmental Protection Agency;
>
> During construction, the use of grading, filling, soil removal and replacement methods that minimize erosion and sedimentation should be required. Tree cutting and other vegetation removal should also be kept to a minimum to reduce soil erosion and sedimentation; and
>
> The use of registered pesticides, herbicides, fertilizers, chemicals and oil should be closely controlled to prevent pollution of adjacent waterways. Extreme caution should be taken in the disposal of animal waste to eliminate entry into waterways of unsuspected hazardous substances.

We are enclosing two copies of the "Federal Environment" and the "Parks, Open Space and Natural Features" elements.

From time to time, the Commission reviews master plans for major Federal installations located on the shores of the Potomac or one of its tributaries. Such times are viewed as opportunities to promote and implement policies of the Comprehensive Plan, and to insure that nothing is proposed that would be inconsistent with the Plan or that would otherwise have an adverse impact on the water. We are, for example, currently reviewing GSA's proposed revised master plan for the southeast Federal Employment Center on the Anacostia River. In addition to our official duties, our ongoing interest has resulted in NCPC being an active member of the Washington Waterfront Action Group (WAWAG).

Again, thank you for this opportunity to comment on issues affecting future uses of the Potomac River. Your Committee's oversight hearings on the state of this River are an excellent way to focus attention on this most important resource and the work that still needs to be done to make it as attractive, safe and useful as possible to the residents of the Washington area and to all the visitors to our Nation's Capital.

Sincerely,

Reginald W. Griffith

Reginald W. Griffith
Executive Director

Enclosures

United States Department of the Interior
NATIONAL PARK SERVICE
C&O CANAL NATIONAL HISTORICAL PARK COMMISSION
P.O. Box 4
SHARPSBURG, MD 21782

IN REPLY REFER TO:

May 28, 1985

Honorable Michael D. Barnes, Chairman
Subcommittee on Government Operations
and Metropolitan Affairs
Committee on the District of Columbia
House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

I appreciate being invited to submit a statement to the oversight hearing on Potomac River safety.

The 19-member C&O Canal National Historical Park Commission was created by P.L. 91-664 to advise the Secretary of the Interior on matters affecting the park. We consider river-related questions frequently, since the park includes many popular river access points and its staff is heavily involved in promoting public safety and responding to emergencies.

It is a constant challenge to foster safe recreation along the strong, changeable Potomac, especially in the Great Falls area, which attracts thousands of people with wildly varying amounts of knowledge, swimming and boating ability and common sense. Commission members are very impressed with the National Park Service's ability to deal with crowds, anticipate problems and carry out dangerous searches and rescues when necessary.

However, despite the conspicuous federal presence, the Potomac is not a federal river. Above the D.C. line it belongs to the State of Maryland, an all-too-silent partner in river management so far.

At the state's insistence, Congress reaffirmed Maryland's authority over the river and its uses, including boating, hunting and fishing, when the C&O Canal legislation was enacted in 1971. The Senate Interior Committee report emphasized:

> The southern boundary of the national historical park will be the north (Maryland) bank of the Potomac River.... Nothing in this bill is intended or shall be construed to extend the jurisdiction of the Secretary [of the Interior] over the Potomac River itself ... (S. Rept. 91-1512, p. 6)

Many of us involved in that agreement expected the state to follow through by developing plans and river safety regulations for the upper Potomac to complement federal efforts on the C&O Canal and provide a firm base for cooperative law enforcement and public education. Regrettably, the state has not acted. Its passivity has left river users on their own and put the National Park Service in an awkward spot with large humanitarian obligations and little authority offshore.

In December the C&O Canal Commission met with representatives of the Maryland Department of Natural Resources about this situation. After learning of the heavy demands on DNR's small planning and law enforcement staffs, we urged DNR Secretary Torrey Brown to enlarge those resources substantially. So far we have received no encouraging response.

One consequence of state inaction is that federal authorities recently have been pushed to enforce the regulation [36 CFR 50.25(h)] against "entering" the Potomac from federal parkland in the national capital area, including Montgomery County. The Commission has not had a chance to discuss this since the crackdown began. Personally, I have several concerns.

To start with, the regulation's meaning is not clear. One commission member has asked whether everyone who launches a canoe from park property near Washington is risking arrest for disorderly conduct. Federal authorities apparently define unlawful "entering" mainly as swimming and wading; the subsection also bans bathing, swimming or wading in fountains, the Tidal Basin and the C&O Canal itself. Yet under this reading, people could be hauled into federal court and fined up to $500 for falling into the river from a rock, or for wading into the shallows at Seneca Breaks to fish with a Maryland license ... but not for recklessly launching an overloaded boat into high water without life jackets. Somehow that misses the mark.

Beyond that, it seems clumsy at best to try to address Potomac safety problems through a regulation that applies only within Washington-area federal parks and is aimed mainly at other types of offenses such as playing a radio too loudly or dropping objects from the Washington Monument. Redrafting the regulation might help, but the jurisdictional problems will remain until Maryland acts.

Finally, area Members of Congress should be commended for spurring the redesign of the deadly Little Falls Dam, and for promoting public education about basic river safety and the Potomac's specific hazards and complexities. A sustained, broadly based educational effort can help an even larger percentage of park visitors to enjoy the river without courting disaster.

Sincerely,

Carrie Johnson

Carrie Johnson, Chairman
C&O Canal National Historical
Park Commission

BACKGROUND INFORMATION ABOUT THE C&O CANAL COMMISSION

The Chesapeake and Ohio Canal National Historical Park Commission was established by P.L. 91-664, the act that created the park. That statute directs the Secretary of the Interior or his designee to consult the Commission from time to time "on general policies and specific matters related to the administration and development of the park."

The Commission was originally created for ten years. In 1980 Congress extended its life for another ten years.

The panel's 19 members are appointed by the Secretary of the Interior for five-year terms. Three, including the chairman, are selected at large; eight are chosen from nominations by the District of Columbia and the states of Maryland, Virginia and West Virginia (two members per state), and eight are chosen from nominations by the four Maryland counties through which the park runs (two members per county). Members serve without compensation.

The Commission currently meets four times per year in various parts of the park and also works through standing committees and ad hoc task forces. Besides consulting with the National Park Service, it maintains liaison with state and local agencies and interested groups and provides a forum for public discussion of policies, problems and projects affecting the park.

In the early stages of park development, the Commission played a major role in shaping the park's General Plan. Recent Commission activities include helping to draft the development concept plan for the park's Georgetown segment, reviewing Whitehurst Freeway alternatives and park-related aspects of several major private developments in Georgetown, opposing a proposed Dickerson site for a new Montgomery County police firing range, encouraging more interpretive activities at the canal's Cumberland terminus, advising on the relocation of the Monocacy boat ramp, and assessing the needs of the Harpers Ferry section of the canal.